WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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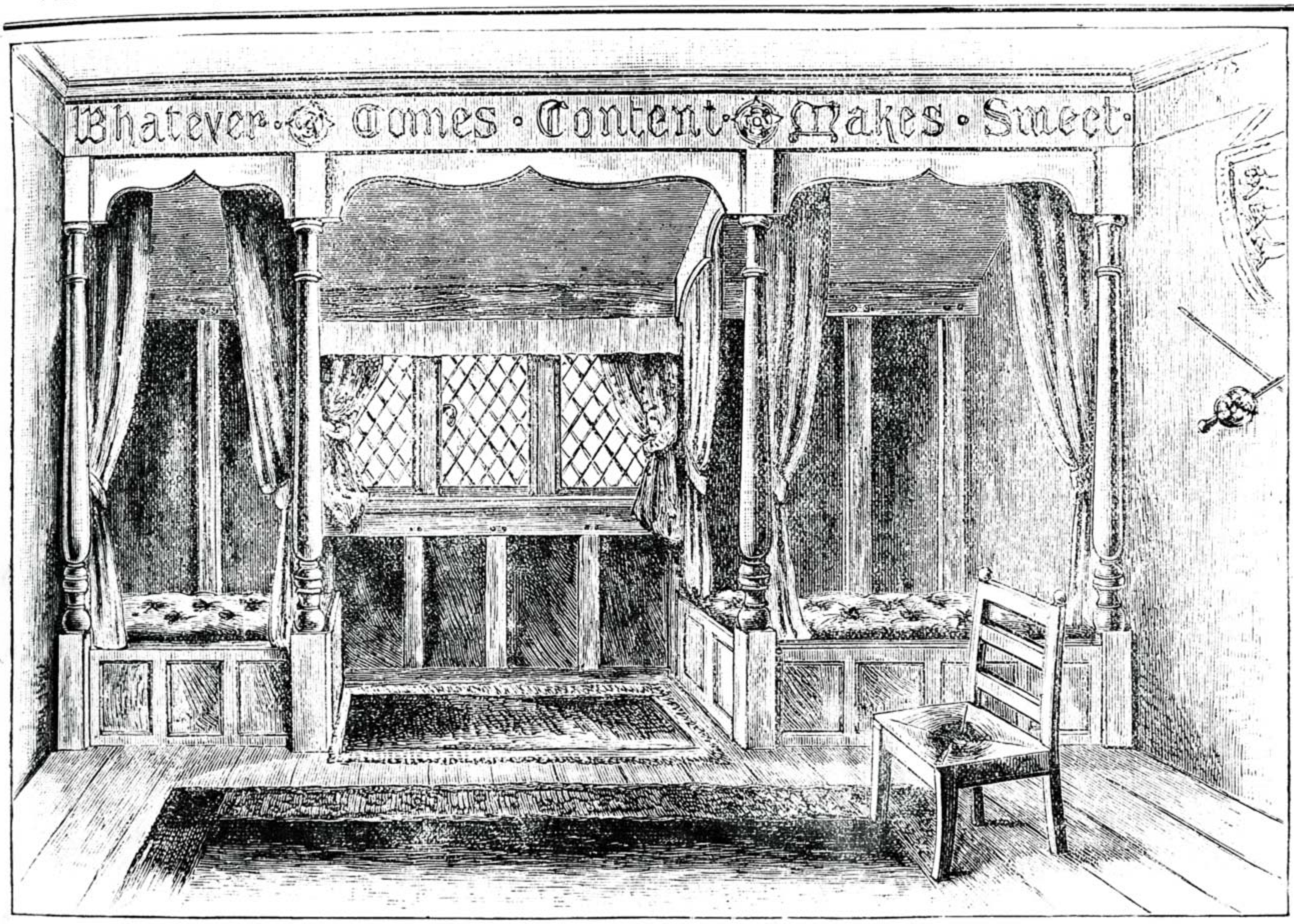

Fig. 1.—Perspective Sketch, showing Treatment of Room with Sloping Ceiling.

HOW TO TREAT A SLOPING CEILING.

A SIMPLE METHOD OF UTILISING BEDPOSTS.

BY F. W. KINNEIR TARTE, M.S.A.

"CAN you suggest a way of improving this useful but ugly room?" said a friend to me not so very long ago. The room he referred to was about 12 ft. wide by, perhaps, 15 ft. long, and about 7 ft. high, with a sloping ceiling along the window end. The slope extends 2 ft. back from the face of the plaster.

The home we were in was a snug and luxuriously furnished cottage, with massive timbers showing on the inside of the rooms. The shape of the room was certainly inconvenient, but at the same time it was wished that it should be made into a snug and comfortable sitting- and smoking-room. My friend being an enthusiastic collector of old oak work, he had amongst other things a number of exceedingly handsome *oak* bedposts; accordingly, it occurred to me that these could in some way be utilised in making a picturesque gallery at the sloping end of this room. Fig. 1 is a perspective sketch of the way in which the room was eventually treated. Should the reader not consider himself capable of carrying out this himself—which I certainly hope will not be the case—he will find the cost very trifling in comparison with the effect gained by the addition of the "gallery." The whole of the work has in this case been executed in old oak as the posts were of this wood, but I see no reason for oak, and should not myself hesitate to have the work carried out in the softer woods, and painted afterwards. I am inclined to favour a rich brown colour for painted work in most reception rooms; excepting, of course, drawing-rooms, and it is not likely that a room with a sloping ceiling would be set apart for this purpose. When the right tint is obtained, brown is a colour of which it takes a considerable time to grow weary.

I shall, therefore, consider that my reader intends to paint the work at completion. Fig. 2 is an elevation of the "gallery." Fig. 3 is a plan, and Fig. 4 a section of the same. Detail A is a section through the beam and arch, showing a side elevation of the addition to the bedposts. Detail B is a section through the seat. All of these drawings are drawn to scale.

In describing the way to carry out this work, I will commence with the beam across the room. This need not necessarily be solid, a case will serve the purpose equally well, and should be constructed with two 1 in. deal boards 10 in. wide, and as long as the width of the room. These will be the front and the back of the beam. The top and bottom pieces will be the same length and 2 in. less than the required total width of the beam. These should be tongued and grooved together as shown in Detail A, and the bottom piece, or underside, of the beam should also be grooved to receive the heads of the posts and the tongues of the arches.

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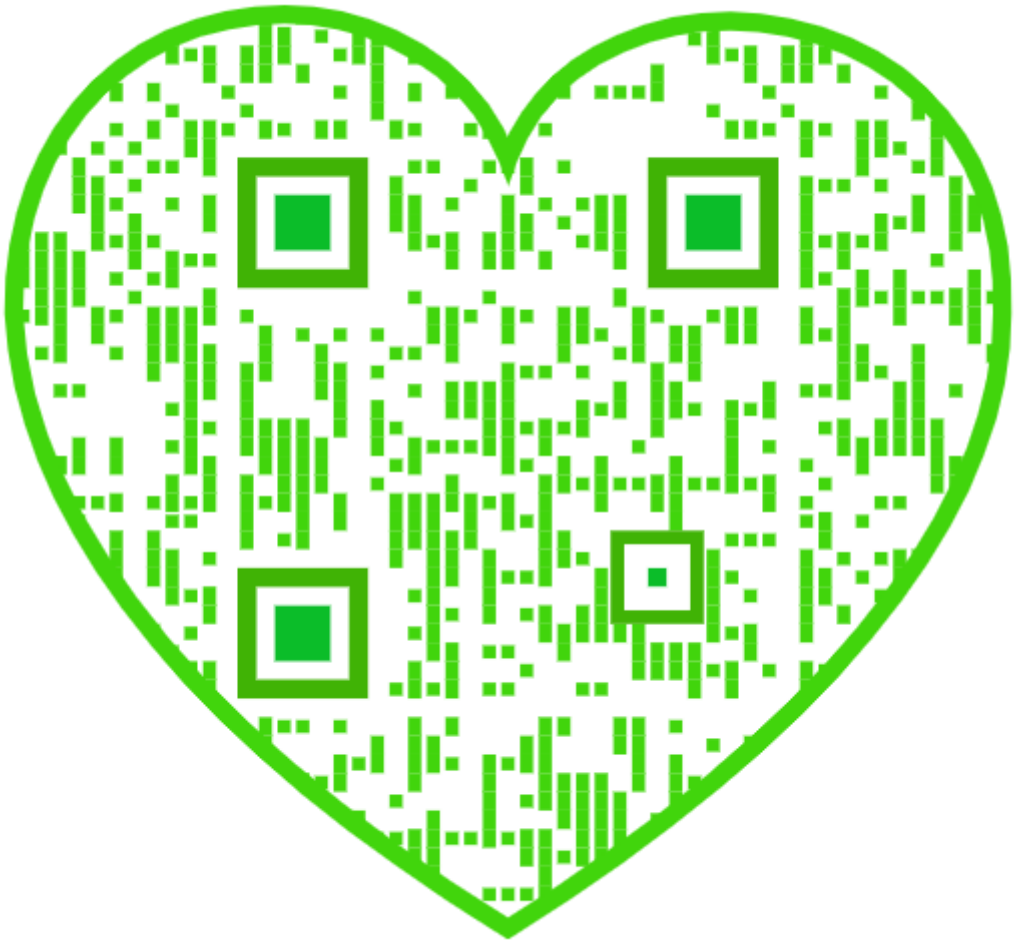
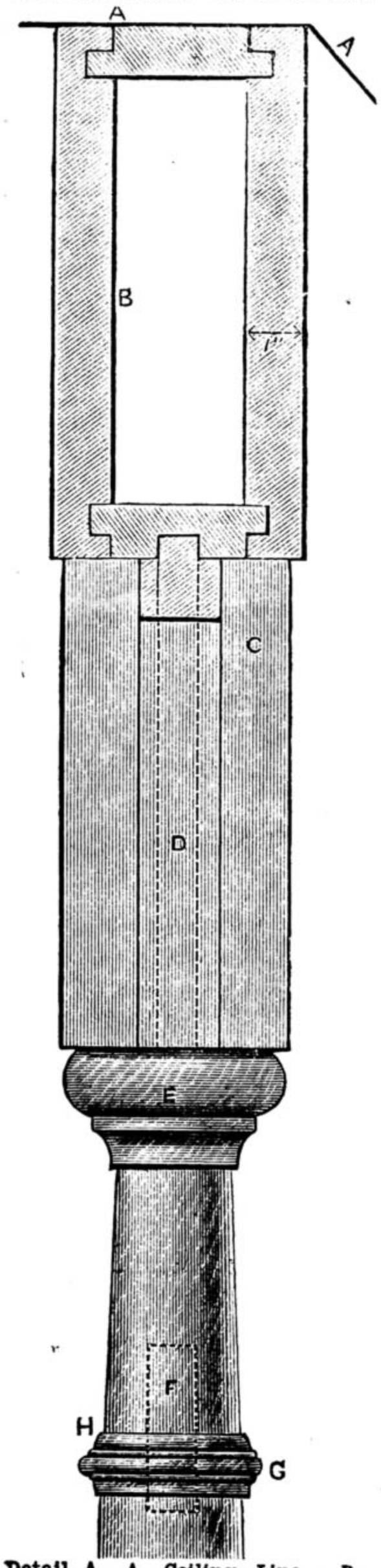


When the beam has been constructed, it should be fixed to the wall at either end by holdfasts driven into the walls from the underside of the beam, and, if possible, made additionally secure by being screwed into the ceiling joists; these screws will be eventually concealed by the cornice moulding which will afterwards be described. The back edge of the beam should be in the angle formed by the flat and sloping portion of the ceiling.



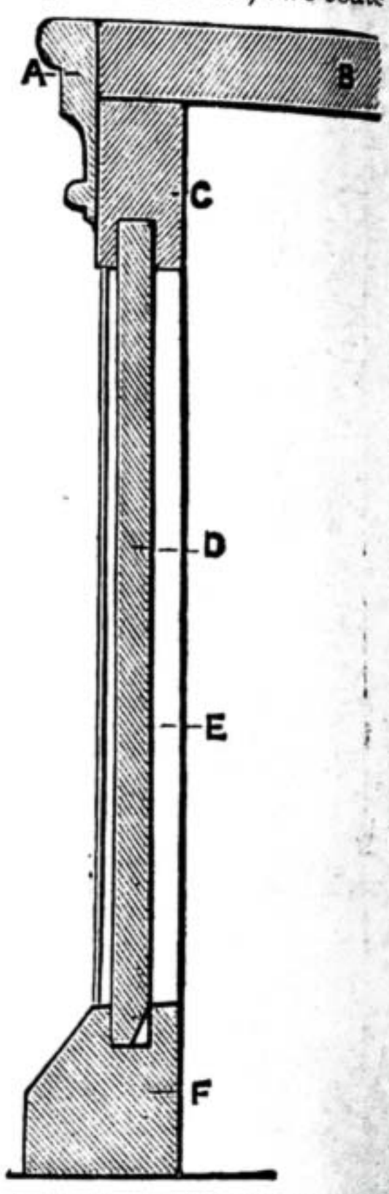
Detail A.—A, Ceiling Line; B, Case Beam; C, Head; D, Arch; E, Capital; F, Oak Dowel; G, Necking; H, Joint.

Next, the posts must be considered. It will be found that bedposts are not more than 5 ft. 6 in. long. This is the length of the posts I am writing about; and it was found necessary to increase them 6 ft. 6 in. This was done by fixing a short portion of shaft, a small turned capital and head dowelled and glued to the old posts with 1 in. by 3 in. long circular oak dowels immediately above the neckings (see Detail A). The joint thus is practically concealed. In lengthening the posts, of course, the total length when finished must be equal to the height between the floor and the underside of the beam, and the head 9 in. long, or equal to the depth of the arches. In addition to this there should be a tongue on the top of the head, to fit into the groove on the underside of the beam. The head should be grooved to receive the arches on either side; and the central heads should be grooved on three faces, so as to receive, in addition, the arches shown in Fig. 4. A post should be placed at the extremities of the beam, and the intermediate posts should be equidistant, or, as in this instance, opposite the window frames. Should the window not be in the centre of the room, as in the case in the accompanying drawings, the arches will be of different lengths; but this need not be considered, as it will add to the picturesque effect of the whole when completed. The head should be screwed into the beam from the sides. The feet should either be screwed to the floor, or inserted into square compartments formed with half round deal, mitred, and then screwed to the floor, by this means forming sockets for the reception of the posts.

The position of the posts having been arranged, it will be necessary to set out the arches. These should be of a length equal to the distance between the posts. The arches should have a tongue along the top and sides to fit into the grooves already described along the underside of the beam and the sides of the heads. In cutting out the arches the wood should be 9½ in. wide, the half inch being the tongue. Care should be taken to keep the shape of the arch flat. Do not get a "*fat*" curve on any account. Three different widths of arches are given in the elevation, and the reader cannot do better than follow these lines. The arch shown in the section (Fig. 4) will depend entirely on the length of the slope of the ceiling. And should the room be as shown in the drawings, it should be cut from 12-in. stuff, with a tongue on the edge next the post head. This tongue should be inserted into the groove already described, and screwed to the upright post forming part of the window framing. Should the ceiling be uneven, as is very often the case in old houses, a moulding should be fixed to the arch along the ceiling line both back and front. The seat should next be formed. This is shown 14 in. in height and formed with panelling, the styles being moulded and 3 in. wide, pegged to sill and top rail, and grooved to receive the panelling. The moulding along the top of the seat is 2½ in. deep; this should be secured with screws to the top rail, which should be made out of stuff 2½ in. by 3 in. deep, grooved on the underside for styles and panelling, and rebated along the back edge, for the frame of the seat. The sill should be out of 2-in. by 2½-in. stuff, grooved on the top to receive the panelling and styles and a splay should be worked along the front top edge. The Detail B shows the splay and the way to frame the fronts of the seats. The sill should be screwed at the back both to the floor and to the top rail, and mortised into the posts at either end. If it is thought necessary to simplify the front, a good way of doing this would be to have a 1½ in. board 13 in. wide, and the length of the space between the posts, the 3 in. moulding being carried up 1 in. above the board to form a rebate for the seat-boards, with a small moulding nailed along the floor and front, to form a low skirting. This board could then have small panels formed by mitred mouldings, nailed on the face. This was frequently done in the 17th century, and the panels thus formed are rendered exceedingly fantastic by the methods of mitring.

Bearers must be secured to the walls along the sides and back, and 1-in. boards laid across from the rebate on the top rail to the bearer at the back. A cornice moulding 2½ in. deep should be nailed along the ceiling line of the beams; and, should there be no cornice in the room, it will be better to carry this all round. The seat may be made in a variety of ways, and I must leave the reader to determine upon what suits his fancy. I should say that a movable cushion, about 2 in. to 3 in. thick, is probably the best form of seat, as it can easily be removed and dusted.

And now for the painting. I always use, and shall continue to recommend, "patent paints." The trouble that one has so frequently to go through in mixing up the tint for workmen is thus avoided, and the material used in patent paints may generally be relied upon as being first-class quality. In my own professional work I mix the tints required at the paint manufacturer's own works, and then it can be ordered in any quantity. Whatever paint is used, let it be *egg-shell gloss*; this is far more satisfactory than a highly glazed or enamel paint. And the *bastard or flatted* paints are rather too dull to be put on work in rooms for every-day use. If a patent paint is used, two coats will be found sufficient; if ordinary oil paint be preferred, it will be found necessary to have three coats. I have seen the process of painting described in back numbers of Work, and therefore consider it would be superfluous to again repeat a description of the operation.



Detail B.—A, Moulding, 2½ in.; B, Boarding, 1 in.; C, Top Rail, 3 in. × 1¼ in.; D, Panels, ½ in.; E, Styles, 3 in. × 1¼ in.; F, Splayed Sill, 2 in. × 2 in.

Mottoes are an old and excellent form of decoration, and more freely used as such in the 17th century, and, indeed, in the mediæval times. We never see a motto in a room but our gaze is arrested. Mottoes may be written in any language. But as we live in England, and there is no dearth of exceedingly appropriate lines, why depart from our own tongue? Probably the reason why mottoes are so rarely seen adorning the walls of our homes is because of the general want of knowledge of where they should be placed; and also, possibly, because of the abuse they receive in churches, where we see them written in plain block lettering, on sheets of tin, and nailed in the very places that would be better if left without them. But no mistake can be made if the motto is appropriate, the lettering good, and the frieze or beam of a room selected as its position. Shakespeare alone supplies a sufficient number of mottoes for the most fastidious to choose from. The one shown on the perspective view is from Herrick: "*Whatever comes, content makes sweet.*" And I have found that this line appeals to nearly every person who reads it. The lettering has been placed on the beam in gilded letters, the capitals 7 in. high, and the smaller letters 5½ in. high, small gilded ornamental stops being placed between each of the words, and the whole well toned down with burnt sienna. The effect is that

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this room has been transformed from an ugly and cheerless one into one where it is delightful and refreshing to sit.

The furniture has been purposely omitted in the perspective, with the exception of one chair, in order that as much of the construction as possible may be seen. Perhaps I might be allowed to say that the curtains shown are hung on rods at the backs of the arches. Heavy material is better than light muslin for curtains, as it adds to the richness of the room in a case of this sort, and is more inviting. For heavy material, plushette is the least expensive in the end, as it will wear for a considerable

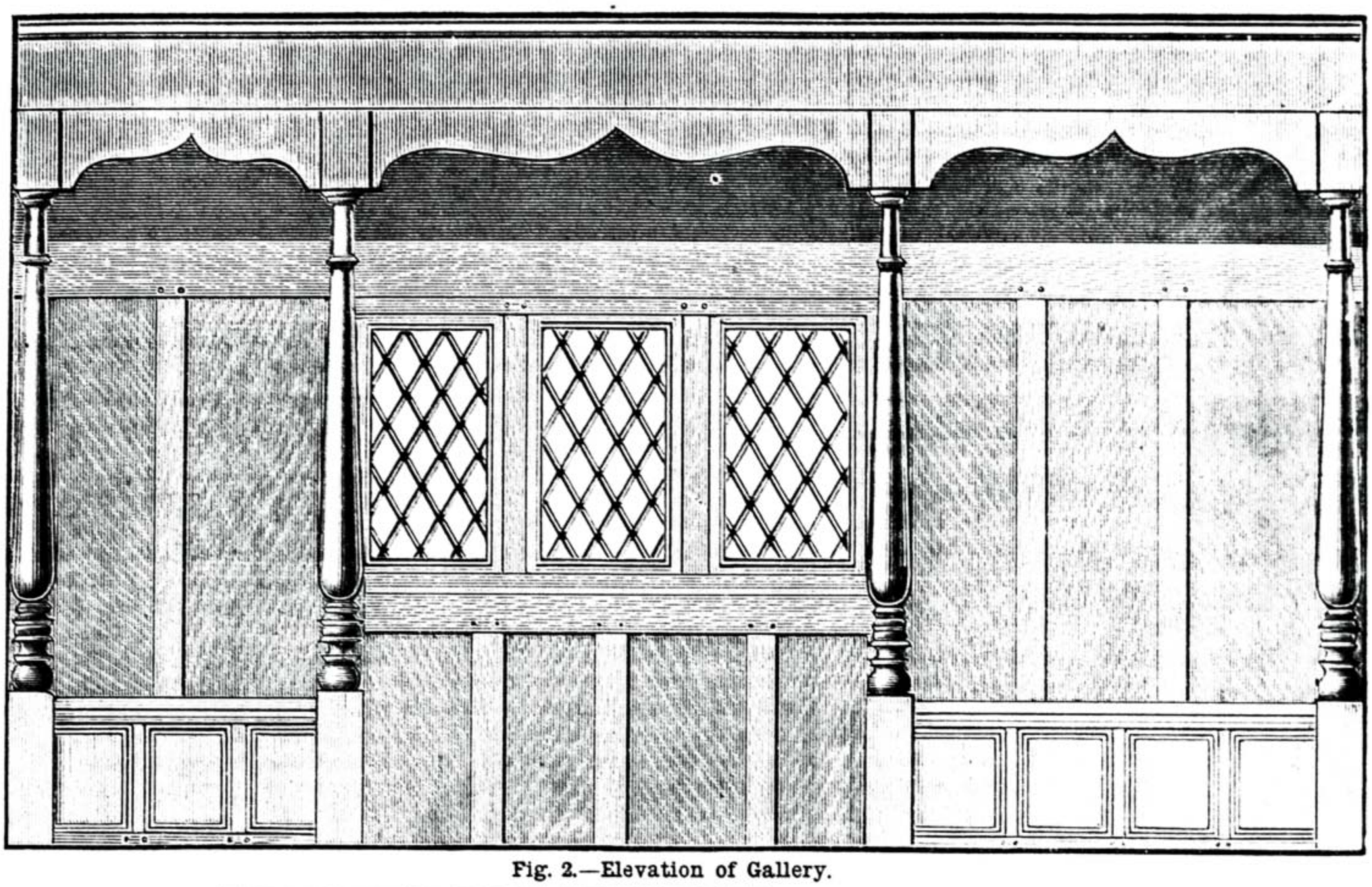

Fig. 2.—Elevation of Gallery.

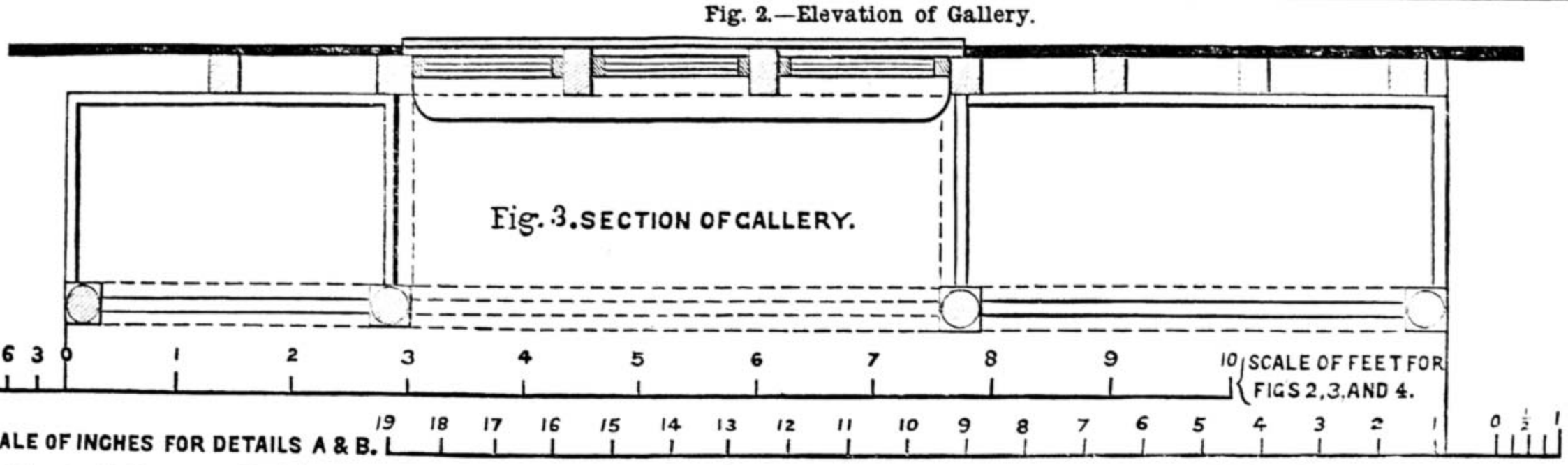
Fig. 3. SECTION OF GALLERY.
12 9 6 3 0 1 2 3 4 5 6 7 8 9 10 SCALE OF FEET FOR FIGS 2, 3, AND 4.
SCALE OF INCHES FOR DETAILS A & B.
19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 ½ 1

period without fading or looking seedy, and, even when it does fade, the colour is still exceedingly pleasant to see; but if economy is a consideration, I know of nothing better than art serge, which can be bought at Burnett's in King Street, Covent Garden, at 2s. a yard, 54 in. wide, in many different colours, all of which are very beautiful. If serge curtains are used, let the cushions on the seats be made of the same material. A short valance should be placed across the window.

In conclusion, perhaps I may be allowed to say a few words with regard to the windows of rooms where snugness is a consideration. In the first place, plate glass may be considered as an article calculated to destroy all attempted artistic feeling. Again, large squares of sheet glass may be placed in the same category. For artistic and, so far as I am aware, for lighting purposes, the diamond shaped, or small squares of lead lights, are much to be preferred. Probably the first thing a person does after having entered a room is to look at the window, and the room will afterwards be judged by the scale taken from the squares of glass. This may seem a comparatively minor consideration to the uninitiated; but it is not so to the artist, who is careful never to overlook such a point as this in his work. The ceiling is another matter of importance, and its treatment may either make or mar the general effect. Do not under any circumstances have a pattern

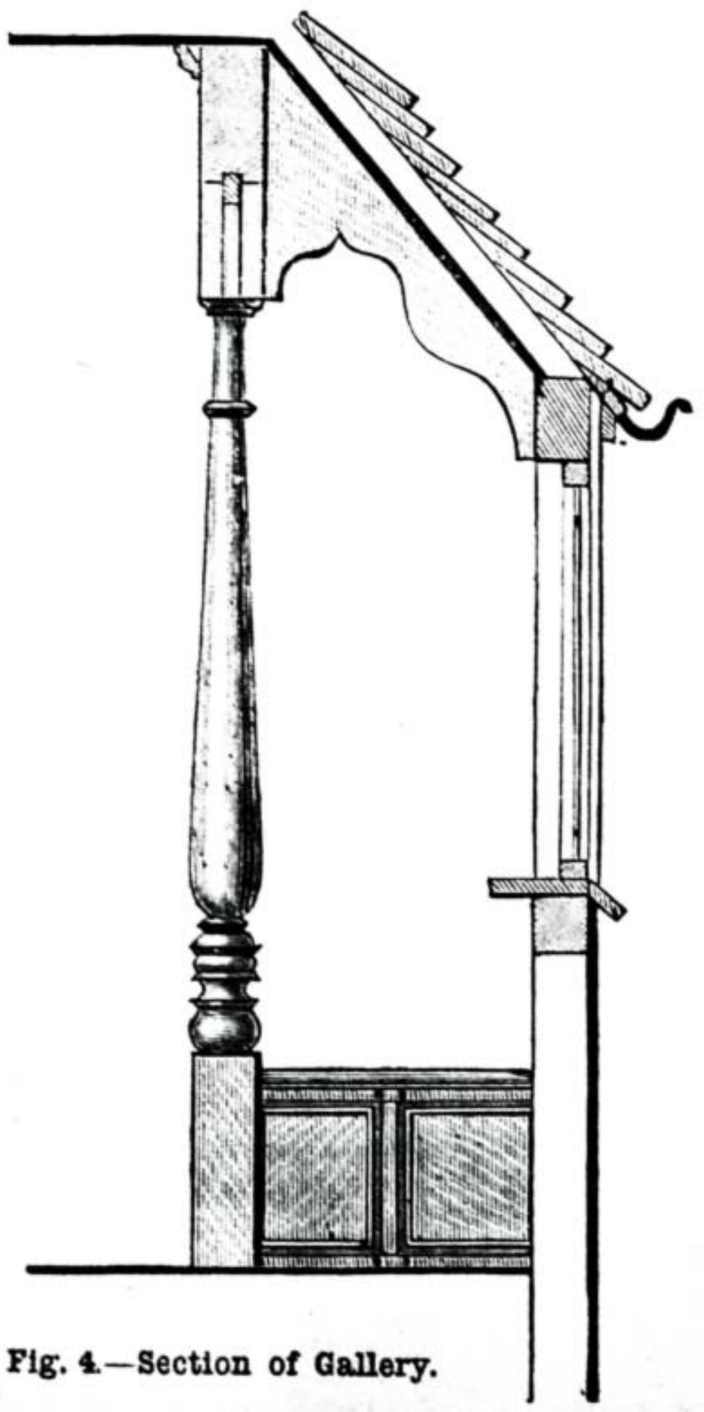

Fig. 4.—Section of Gallery.

paper on it. Plain white ceilings are usually preferable, but the whiteness may be toned down if wished to harmonise with the general scheme of colouring.

The floor should be stained with two coats of Jackson's walnut stain, wherever it is not covered by rugs or carpet. And to complete the whole, an Oriental rug may be laid on the floor below the window.

PLAIN AND DECORATIVE HOUSE PAINTING.

BY A LONDON DECORATOR.

OILS, VARNISHES, AND OTHER VEHICLES: SOLID AND LIQUID "DRIERS" (*continued*).

As a useful practical appendage to the remarks in No. 42 concerning the source and nature of painters' varnishes, the subjoined *résumé* of those particular varieties in general use will commend itself to the interested reader and worker.

For the finest interior work, *white oil varnish*, that is, a liquid which can be spread and worked upon broad surfaces, and such as will dry in about eight hours, is very requisite. Various eminent firms make such a varnish for decorators and painters, and sell it under such fanciful names as "Coburg," "Italian Oil," and "French Oil Varnish." The chief attributes aimed at are freedom from yellowness and the possession of good "hand-polishing"

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qualities—the latter process I will explain in the advanced part of the subject. The price of such a white interior varnish would be from 20s. to 30s. per gallon to the trade.

After this "polishing" varnish, a maker's list usually contains one or two varieties of what are termed *superfine copal* varnishes. These range in price from 16s. to 20s. per gallon, possessing different names and features, such as "polishing" and "extra hard-drying."

Lower down in the scale of costliness we find the best kinds of ordinary *copal varnish*. Many varieties are made of this quality, and for such purposes as the names *inside copal* and *outside copal* convey to the purchasers. The prices of these range from 12s. to 16s. per gallon.

The "cheap oaks," as they are usually termed in the trade, are generally a most serviceable class of varnish, and can be purchased, suitable for all kinds of interior and external surfaces, at from 8s. to 12s. per gallon.

If there is one article above the other "thousand and one" used by the house painter in which quality is *the* essential consideration, that article certainly is varnish. The prices given above are more for relative comparison than as any guide to purchasers, but they are well representative of the best makers' current prices.

Preparations of coarse oil and common resins are placed upon the market at much lower prices; such as these I would especially warn the worker against, and advise the inexperienced, especially, to purchase always an established maker's goods through—if necessary at all—a reliable retailer.

There are yet a few other varieties I must mention, and of these *hard drying* or *church oak* varnish is a "good friend" to us, although in copal oil varnish, quickness of hardening must generally be accompanied by a tendency to lose gloss and to crack from excess of resin. A preparation known under the above names is always to be had for seats of public buildings, stained floors, and common furniture, for which it is invaluable. This make of varnish, retailed at about 2s. per pint, is the "right stuff" for kitchen furniture and so forth; since, unlike many and even expensive painters' varnishes, it does not get soft and sticky by the warmth of the body, whilst its oily nature makes it very durable. The litharge or similar substance with which it is prepared, however, considerably darkens the oil, so that this would not do for light-coloured paint.

Maple varnish is but another name for a good quality of interior copal varnish, made from the lightest gums and refined oil, so that when coated over such delicate "figure" as the imitation of maple and satin wood, it shall not disadvantageously affect the colour of the grainer's work.

The varnishing of *wall papers* is a very important item of painters' work, and whilst the old paper-stainer's abominations, "sienna-marble" papers so-called, are being rapidly relegated to their proper—the *lowest*—sphere in the scale of æsthetic beauty and common sense, covering the walls of middle-class houses with pattern papers suitable for varnishing on staircase, bath-room, and kitchen walls especially, is a commendable and growing practice, consistent alike with sanitation, durability, and decorative effect. For all paper hangings on which the yellowness of copal varnish would not be detrimental to the colour of the design, a good quality of this variety is far preferable to the "paper" varnishes sold by the manufacturing houses. Whether used upon walls or woodwork, a moment's consideration will show that the colour of copal "oak" varnish would spoil such tints as French or green greys, delicate pinks or white; but for what we term "terra-cotta" shades, buffs, and "leather," or cinnamon colours, the yellowness would be no disadvantage.

Where *white* paper varnish is necessary, we use that which is termed *crystal paper* or *fine pale paper* varnish. The first is the whitest, and as it can contain but little linseed oil, it requires very expeditious and experienced working over large surfaces. *Crystal paper*, *copal cabinet*, and *quick furniture* varnishes come under the heading of volatile oil varnishes; so also does mastic varnish, used for varnishing paintings, maps, etc. Whilst genuine "mastic" costs about 50s. per gallon, the cheap substitutes given above range from 14s. to 20s., trade price.

Amongst the purely *spirit varnishes*, "white hard" and "brown hard spirit varnish" are the two most useful. They are similar in nature to French polish, all being prepared from various kinds of *lac*—shel-lac, etc.—and spirits of wine, or "methylated" spirit. The lustre they give is nearer to that of French polish and "softer" than that given by a "copal oil," hence "white" and "brown hard" are much used for furniture as a substitute for the more tedious process of French polishing, and also upon those portions where the "rubber" could not be used; they cost about 8s. per gallon.

Bath varnish is a very hard-drying, white liquid, similar in nature to the "enamels" now on the market, but is a more durable article, and resists the action of hot water to a greater extent than the other preparations. Its price is about 20s. per gallon.

Beyond all these herein enumerated, there is a further variety of "carriage," "boat," and "implement" varnishes. These are outside the scope of this paper, but any information concerning them will readily be given to any inquirer through the invaluable and entertaining columns of "Shop."

Before turning to the subject of "driers," there are a few *vehicles* and liquids used by the painter which scarcely come under the above heading of "oils and varnishes," but which are, nevertheless, indispensable to the trade. The word varnish is so identical with a glossy surface, that the name "flatting" or "lustreless" varnish, given to a preparation of oil of turpentine, copal, and wax, is somewhat a misnomer. It is not often called for, since it possesses very little body, but, upon timbered and ornamental wooden ceilings, can be used with decided advantage over ordinary copal, the small amount of wax gloss it gives out being far more restful and natural for such positions than a bright hard glitter. *Black japan* is a species of black copal varnish, made in various qualities, and the best for carriage painting. House painters seldom use it for other than blacking grates and ironwork, although there are many purposes it can be used for Thinned down with "turps," it makes a capital stain for wood of a rich brown colour. *Berlin black* is another preparation useful for various purposes, as it is a dense black, drying with only an egg-shell gloss; it is prepared, however, like brunswick black, chiefly for ironwork. Cheaper black varnishes, similar in nature to "Brunswick," are also to be purchased at 4s. per gallon.

Patent knotting, or *knotting composition*, is a brown spirituous varnish, used chiefly for touching over the knots in woodwork previous to the "priming," or first coating, being spread. It is also useful for coating over stains and other effects of dampness on walls previous to their painting.

Varnish stains are liquids of similar nature and preparation to brown hard spirit varnish, but are coloured with permanent vegetable dyes to represent, when spread on clean white wood, the various colours of oak, walnut, mahogany, etc. When applied without any previous preparation, two coats are necessary to get a glossy effect upon new wood. As a varnish and stain combined, they are most useful and convenient for picture-frames, fretwork, and other little matters.

Japan gold size, or "Japanners," is a liquid used for a great variety of purposes. Notwithstanding the name appears to connect it with processes of gilding, it is seldom used for that purpose, but rather as a liquid driers in combination with "turps" and "flatting" paint. Japan gold size is a preparation of linseed oil and litharge, and will usually dry in about half an hour. When nearly dry, it has to a slight degree that property of *tackiness* which is so characteristic of oil gold size, but with very little of the brilliancy of the latter. Only on out-door work, where it is advisable to complete the gilding forthwith, for temporary work, or for sign writing can it be recommended as a *gold size*.

In coach painting, engine work, and, to a minor extent, in house painting, "filling up" compositions, prepared with japan gold size for hardening it, are much used, and in preparing "dead" black from *Ivory Black* ground in turpentine, this is also the best and safest binding liquid.

Having now reached the "binding" or drying agents, a few lines will suffice to complete my paper.

In noticing the properties of the expressed oils, the advisability, and generally the necessity, of adding some substance powerful in oxygen to our paints, in order to ensure their proper hardening, was briefly touched upon. Of these substances there is a considerable variety, which may be used to more or less advantage, according to their chemical nature and their effect upon the colour of our paint. *Red lead*, for instance, is a good natural drier, but, of course, this would not do for assisting the *white* paint to oxidise. The subjoined articles, however, represent the principal drying sources of all liquids and paints: viz., *sugar of lead*, *sulphate of zinc*, *litharge* or *oxide of lead*, *white copperas*, *white sulphate of manganese*, and *white borate of manganese*, of which list the two last are the most expensive. Nowadays, it is not necessary to "rub up" our own litharge or sugar of lead, for they are offered to us in the less pure, perhaps, but far more convenient form of *liquid driers* and *patent driers* respectively.

Terebine, or liquid driers, is doubtless prepared in a manner similar to japan gold size, but with a greater proportion of the solvent oil of turpentine: in fact, almost substituted for the linseed used in the latter. Its price is about 10s. or 12s. per gallon, and it is most useful for the quick drying of all dark and outside paints. Patent driers, in the paste form, is best for white lead paint. About one-tenth part, weight or bulk, is enough for all ordinary work, and less under good drying conditions of the air, when one ounce to the pound is ample. Its price is a little above that of genuine white lead.

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SIGN-WRITING AND LETTERING.

BY HENRY L. BENWELL.

PIGMENTS, GOOD AND BAD—TINT MIXING FOR SIGN-WRITING USES—TABLE OF THE PRINCIPAL TINTS, HUES, AND SHADES USED BY SIGN-WRITERS—"GROUND" AND "LETTER" COLOURS—EDGING LETTERS—COLOUR TABLE FOR BEGINNERS.

CONTINUING my remarks on colouring, we must now consider one or two practical subjects in connection therewith before leaving the subject. The general qualities of good pigments, technically called colours, are, according to the authority of Mr. George Field, as follows: (1) Beauty of colour, which includes pureness, brightness, and depth; (2) body; (3) transparency or opacity; (4) working well; (5) keeping their place; (6) drying well; and (7) durability. But few pigments possess all these qualities in equal perfection (I have already pointed this out in a previous chapter). Body, in opaque and white pigments, is the quality of efficient covering and hiding ground: but in transparent pigments it signifies richness of colour or tinting power; working well depends much on sufficient grinding, or fineness of quality; keeping their places and drying well depends greatly on the vehicles with which they are diluted or tempered. Durability also depends on the fine quality of both the pigments and the vehicles, and the varnish used as the finishing coat. Bad varnish, as every one knows, or ought to know, ruins a sign as quickly as bad oil and colours, and is the most general cause of premature deterioration of work in this direction. This being a subject which the student requires to have exceptional knowledge of, and space not permitting of its further extension here, I must ask him to continue his investigations by referring to Chapter IV. in "The Grammar of Colouring," and thereby well grounding himself in useful knowledge.

We now come to the mixing of tints, in which great care and caution are necessary, not only to be able to obtain a lasting colour, but also a bright and clear one; which, owing to insufficient knowledge and carelessness on the part of workmen, are generally those very qualities which are absent in home-made tinted colours. Now, as a rule, the ordinary house painter is a failure as a tint manipulator, mostly because he uses the wrong colours, or too many of them; is not sufficiently clean in his methods, and does not devote half the necessary time required for proper and thorough mixing. How often does one see a pure, bright, clean tint, and one which has not faded? But how can it be otherwise, when the one result of improper mixing, or, I should say, the insufficient amalgamation and blending of the colours used, is a muddy, impure, and uneven tint? Now this will not do for the high-class decorator and sign-writer; he must have bright, clean colours, or he will prove a failure. In compounding tints, one great consideration is to find out how to get the tint, shade, or hue required with the least number of colours; as, generally speaking, the less the number of colours used in making a tint, the purer it is. But it must be clearly understood that we must not depart from the proper colours necessary for the correct rendering of any tint and substitute others, for the simple reason that they are fewer in number than those given in the recognised formula. No; we should be as much wrong that way as the other; but there are often more ways than one for obtaining most tints, etc., and those which contain the least number of ingredients in the shape of colours often give the best results.

White is the basis of all tints, and here again it is upon the virgin purity of this basis which depends the success or failure of the resulting tint when the white is stained with colours. Of course, we must have the best and *palest* linseed oil for diluting and thinning, otherwise that fault alone would spoil our work. The theory and practice amongst workmen, in regard to compounding tints, is this. The very best white lead (or for indoor work, zinc white) is thinned down to a working consistency, or nearly so, and the requisite amount of driers added. The paint must here be well stirred, and left in this state long enough for the driers to incorporate with the oil, etc., say, for half an hour. Next, strain the paint carefully, and thin out the colours required for the tint; if these are to be added in certain proportions, which are given, such as three parts of one colour, two of another, and four of another, they should be measured, well mixed together, and gradually added to the white, which must be kept constantly and well stirred until the desired tint is obtained. The theory is, that there is a certain amount of white paint which we desire to transform into some delicate tint, and to do this we dye it, or, as it is technically called in the trade, "stain it." It will therefore be seen that this is a somewhat different proceeding to taking up certain portions of any two colours, such as red and yellow, and mixing together to obtain another colour—orange. Hence, certain transparent colours, such as Prussian blue, siennas, and lakes, are called "staining" colours because they are used to obtain certain tints, commonly called colours, by dyeing their basis white to the required tint.

The sign-writer seldom has occasion to mix tints but in very small quantities, and he often does this work on his palette by dipping his brush in first one colour and then the other, and rubbing them out on his palette and adding the white. This is a dirty, untidy method; it is much cleaner to take a little of each colour on the tip of a small palette knife, wiping it clean of one colour before introducing to it the next, and then mixing with the knife or brush. I now append a selection of tints specially used by sign-writers, taken from

THE SIGN-WRITER'S TABLE OF TINTS AND SHADES.

Buff.—This is a mixture of pale chrome yellow and white, tinged with a little Venetian red; carnation, lake, and white.

Chocolate.—Vegetable black and Venetian red; or white, Spanish brown, Venetian red, and vegetable black.

Claret.—Red, umber, and black.

Cream.—This is a mixture of chrome yellow, Venetian red, and much white.

Drab.—Raw or burnt umber and white, with a little Venetian red.

Common Flesh Colour.—Stain white lead with light red, and add a very little yellow ochre.

Fine Flesh Tint.—White, lake, vermilion, and Naples yellow, or yellow ochre.

Fawn.—White and burnt sienna, ground very fine; white, burnt umber, and Venetian red; white, stone ochre, and vermilion.

Grey Tints.—White and verditer, a blue hue; white and indigo, a blue hue; white, Indian red, and indigo, of a brown hue; white, light red, and Prussian blue, of a brown hue; white, burnt sienna, lake, and indigo, of a brown hue.

Green Tints. (These are somewhat important in fancy work.)—White, Italian pink, Prussian blue; Prussian blue, chrome yellow, and burnt umber (olive green); Prussian blue and yellow chrome (liable to fade); yellow ochre and indigo; raw umber and indigo; brown, pink, and indigo; raw umber and Prussian blue (sage green); white and Brunswick green (pea green).

Lead.—White, black, and indigo.

Peach.—Vermilion, Indian red, purple brown, and white; white lead tinged with orpiment; white, red, blue, and yellow.

Pink.—White, vermilion, and lake; white, crimson lake, or scarlet lake.

Pearl Grey.—Prussian blue and black, equal portions, and white.

Snuff.—Vandyke brown and yellow.

Sky.—Prussian blue and white.

Salmon.—White tinged with Venetian red; white tinged with vermilion; white tinged with yellow chrome, raw umber, and vermilion.

Silver.—Use white lead, indigo, and a little black, according to the shade that it is required to produce.

Straw.—White and pale chrome.

Violet.—Prussian blue, black, vermilion, and white; French ultramarine, white, and a little black.

Gold.—White, stone ochre, and red; pure light ochre; white, yellow chrome, and burnt sienna to desired shade.

Lilac, Lavender, and French Greys.—White, lake, and indigo; Indian red and Prussian blue; white, indigo, and rose pink: white, Prussian blue, and a little vermilion (French grey); white, with a little violet (lilac).

This list, which has been carefully compiled, will, I hope, be found of great service—to the young sign-writer just starting in business especially—to readers and workers alike. It must not, however, be taken as accurate throughout, and in some cases, even where it is perfectly so, the worker may fail for a long time in getting the desired tint, owing to the wrong proportions being added of the various colours composing the tint. These proportions can only be found out by repeated practical experiments, as of course the colours are not mixed in equal parts, but in such proportions as are necessary to give the tint or hue required. Mr. Field recommends the student to mix the various tints in different hues, giving in each experiment a predominance to one or other of the component parts. This is excellent advice, as I can prove from experience, as although I have only lately seen these remarks, it was a method I thought of, and practised when younger, and with good results. It will be found, when experimenting, that the smallest addition of any one colour gives the predominating tone of the tint, which also makes it warm or cold; by adding more white we produce a lighter tint, and by adding more of all the darker colours a deeper shade of the tint. But to thoroughly understand and grasp this subject, the student must study and understand the proper technical meanings of "tint," "shade," "hue," and "tone." The leading, or "key-colour," I may add, always gives the latter, which is the general effect of the colouring as influenced by what are called warm or cold colours. Warm colours, so called, are those in which red or yellow predominate; and cold colours those in which blue and green tints appear.

I have not yet spoken of neutral tints. Grey is termed, by way of eminence, the neutral tint, being the mean between black

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and white; but any two of the secondary colours will neutralise each other as well, also, as the primaries in due proportion. The neutralising or compensating power is the foundation of all agreement or harmony amongst colours. Another thing which requires much thought and study is *contrast*, which, fully explained, is the "opposition of any two things as to character, whether it be in lines, lights, shade, or colour," or to place figures, or colours, in such opposition or dissimilitude, that the one shall give greater visibility and effect to the other.

We have next to consider a few rules relating to the arrangement of the colours used for the letters, and their harmony and keeping with the ground colour upon which they are painted. In the first place, the ground colour should not be of a bright and glaring nature (except in special cases where a certain colour is used as a sort of trade mark or distinguishing sign); on the other hand, it must be of a subdued and quiet tone. A ground of some bright colour will not show up writing of a brilliant and showy description half so well as one of a quiet and neutral tone. Letters always stand out with greater prominence and distinctness on a quiet secondary or tertiary colour than on a primary colour, unmixed with white. Letters on a neutral subdued ground are brought or thrown forward; on a bright gaudy ground they are lost, the greatest prominence being given to the ground itself. Another thing to remember is that the style, arrangement, and colouring of a sign should be suitable and in taste with the trade, business, or profession which it represents; for instance, a sign with gold shaded letters on a lavender ground, surrounded with a black and gold moulding, although proving attractive enough for an undertaker's or a mourning warehouse, would look miserable and entirely out of place outside a gin palace, a confectioner's shop, or even a photographer's studio; although the latter is more or less associated with the "black art." The great point in colouring a sign is to make its colours, as far as possible, emblematic, and suggestive of the business indicated thereon. Of course, the style of lettering employed must also be chosen on the same lines, but with the alphabet we have, at present, nothing to do; suffice it to say that in every process it should be the earnest effort of the writer to emblematise in some way every sign he paints. The great thing to know is the exact effect a given combination of colours will produce as a finished whole. We frequently see a yellow and even a red letter on a black ground; now you must always pity the poor fellow who did that work, for he has not one atom of judgment or taste, and has in his own self his worst, bitterest enemy, as far as regards his advancement in his art. Such colouring always bears a common stamp, both of effect and workmanship. There is a given rule that one colour shall not ride over or overlap the other, so that it is necessary to divide the letter colour from the ground colour, with a thin line running round the edges of letters. Let us suppose we have painted some green letters on any dark ground with a reddish hue, such as, say, purple brown, and notice the harshness of the contrast; but outline the letters with white or gold colour, and see how all is softened down by this simple expedient. Again, put in an emerald green colour, and write your letters with vermilion or Chinese red: the result is worse than in the first case; but edge them with black or gold, and you are again safe. Mr. James Callingham, speaking on this subject in his work on "Glass Embossing and Writing," * points out how important it is to bear in mind that coloured letters on a coloured ground should never be used unless they are at least invested with a white or gold edging; and if a gold thickness can be added, the effect will be heightened. A black cast-shade will throw the letters out, and help to give them a raised appearance. In some cases a coloured thickness may be rendered effective on a dark ground, so long as the indispensable gold or white line be not neglected; but it ought never to be allowed to impinge upon the colour of the letter itself, unless that colour be an imitation of, and a substitute for, gold; in which case it ought not really to be regarded as a colour at all, but as the thing for which it is substituted. This principle was exemplified by Mr. Owen Jones in the interior decoration of the Great Exhibition of 1851. Here, the primary colours were so arranged as to neutralise each other; and in order to avoid any harsh antagonism from their contact, or any undesired complementary secondaries arising from their immediate proximity, a line of white was interposed between them, which had the effect of softening and giving them their true value. I may add that the foregoing remarks do not apply to letters on a black ground, because black is not a colour, in the strict sense of the word. The edging round the letters must be boldly and neatly done, especially on gilded work, with the best sable pencils; it must show no sign of timidness or indecision, otherwise the line will have a rough, ragged appearance, and completely spoil the letters. Gold letters, in fact, show up an unequal line in an instant.

It will require some little time before the student finds out what coloured letters look best on the different grounds; but sign-writing is not by any means a hidden art, as we have only to perambulate the streets to find hundreds of practical examples. Mr. Callingham's book, just mentioned, also gives a host of information on this subject, and to which I must refer the more advanced student thirsting for further information on this subject. For immediate use I append a short table, each item being numbered for possible future reference.

A TABLE SHOWING WHAT COLOURS TO USE FOR LETTERING ON VARIOUS COLOURED GROUNDS.

	Ground Colour.	*Letter Colour.*	*Shadows.*
1	Stone colour	Black	White and dark stone colour
2	White	Any colour	Any colour (Plain)
3	Black	White or gold	
4	Light blue	Dark blue and vermilion	Light blue, dark shade, black, etc.
5	Bronze green	Gold, yellow, red	Vermilion, emerald green
6	Marble	White incised letters	—
7	Mahogany graining	Any light colour and gold	Various
8	Walnut	Any light colour and gold	Various
9	Oak graining, dark	Gold or red	Dark colour and black
10	Oak graining, light	White	Black
11	Chocolate	Pink, salmon, fawn, primrose	Letter colours and black
12	Dark blue	Gold, outline white	Plain
13	Medium blue	Gold	Orange and Vandyke
14	Vermilion	Gold or yellow	Green, white, and black
15	Sage green	White	Purple brown and black

* "Sign-writing and Glass Embossing" (Brodie & Middleton. 5s. 6d.)

The preceding is but a short list, inserted here for the special purpose of giving some slight assistance to the beginner having no knowledge on the subject, and refers mainly to simple plain lettering. The learner should now be able, from the directions given, to proceed with the practical application of his colours with some degree of success.

MEANS, MODES, AND METHODS.

A NEW MATERIAL FOR BILL-STICKERS' PASTE.

SINCE Free Trade has cheapened the corn for the people, we hear less of adulteration of flour by salt, alum, ground bones, etc.; but, cheap as it is, it is a pity that tons of flour are used up for paste yearly by bill-stickers. It was said at the last School Board election for London, that the flour used for paste for the bills of the rival candidates would have supplied bread for many weeks for the famished children sent to the schools. Unfortunately, it is not the worthless flour that is used, but some of the best. Anything to prevent this scandalous waste of good food deserves a welcome from thoughtful persons.

A good substitute has been found by Messrs. Bull & Hofsten, natives of Norway. It is prepared from the whale's blubber. It is colourless, quick-drying, and very adhesive. Of its cost and continuity of supply, no statements are to hand. But from the seaweed that forms banks on our beaches an endless supply of gluten sufficient for bill-sticking could be made cheaply, and the by-products, by their utility and sale, would serve to make it cheaper even than flour.—J. C. K.

A BRIGHT RED VARNISH.

Procure some red sealing-wax, or any other colour, according to taste, and also some spirits of wine. Break the wax up into small pieces, about the size of peas; put these into the spirits, and put the bottle by in a warm place for a day or so. If, on examination, it is too thin, add more wax, and if too thick, a little more spirits. This is a capital varnish for iron or wicker-work, as it dries quickly, and with a good gloss. The varnish thus produced will be found useful for colouring or coating fishing floats, and a variety of like purposes.—E. A. P.

[Varnish of any colour, as it has been said, may be made in this way, by using sealing-wax of the colour required.—ED.]

IMITATION CORAL.

Procure some acorns or gall-nuts; cut a little piece off each end, and bore a hole through them lengthways with a bradawl or short knitting-needle. Then take some of the red sealing-wax varnish, and dip the acorns or nuts well in it, rolling them about until they are evenly covered; then string them on wires until dry. They make very good imitation coral necklaces, and are useful for a great many decorative purposes. Small twigs can also be used, and are very like coral branches.—E. A. P.

[Smaller articles than acorns or gall-nuts should be used for imitating coral for a necklace.—ED.]

CHEAP INK.

Take a 3d. packet of Judson's dye—any colour according to taste; dissolve in a small bottle with a little hot water, and when dissolved, fill the bottle with cold water. When required for use, pour a little into the ink-pot, and dilute with water to required weakness.—E. A. P.

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PRACTICAL HINTS ON MOUNTING OBJECTS FOR THE MICROSCOPE.

BY A. T. SMITH.

GUM DAMMAR—PREPARATION—GLYCERINE JELLY—FARRANT—MOUNTING SECTIONS.

As the method of preparing objects for mounting in gum dammar, as well as the actual process of mounting, does not differ from that employed for mounting in Canada balsam, it is hardly necessary to recapitulate, and I will content myself with just giving a few hints as to the best way of preparing the medium itself for use. It should be prepared as follows :—

Choose a few clean and clear pieces of the gum and drop them into a little pure benzine. When the gum is dissolved, if the solution is not perfectly clear, strain through several thicknesses of fine dry muslin which has previously been washed quite clean by passing through it a strong stream of cold water.

The solution should now be perfectly clear, and like the solution of balsam, of about the consistency of olive oil, or perhaps slightly thinner. It should be kept in a similar bottle, which, indeed, will be found a very convenient form for keeping all kinds of mounting media in, as it is important that all dust be most carefully excluded. This is almost impossible in the case of an ordinary corked or stoppered bottle, for when the medium is in use the cork or stopper is bound to be placed on the table on its side, or with the bottom turned up, in either of which positions it is sure to pick up fragments of fibre and dust from the atmosphere or the table, and these subsequently find their way into the medium.

Glycerine, as I think I have already said, is, in my opinion, one of the most useful mounting media we have, it is capable of such universal application and gives such beautiful results.

There are, of course, some objects such as diatoms and some crystals which cannot be successfully mounted in glycerine, but these are exceptions, and, as a general rule, every class of object is better displayed, and is seen to greater advantage in glycerine than when mounted in any other medium ; and it is an undoubted fact that there are many objects which from their very nature it would be absolutely impossible to mount successfully in anything else. It is in glycerine, too, that those beautiful preparations of insects are preserved which have of late attracted so much attention. I refer to those mounted in cells so as to retain as nearly as possible their natural form and colour.

Glycerine as a mounting medium is capable of such endless modification that it is almost impossible in the short space at my disposal to do more than indicate briefly a few of the principal forms in which it is used for mounting specific classes of objects, and how these objects are best prepared.

I have already referred to the preparation of glycerine jelly and Farrant's solution, and the two other forms in which I have found it most useful are in its natural state with the addition of a little pure carbolic acid, or diluted with water and a trace of carbolic acid.

Glycerine jelly is useful for mounting sections of green wood either stained or unstained, roots, leaves, some of the coarser forms of algæ, and, generally speaking, objects which without deterioration will bear the slight amount of heat requisite for mounting in the medium, but will not stand the drastic course of treatment necessary for preparation and mounting in Canada balsam.

The objects referred to above require very little preparation except just carefully washing in water, and then soaking in pure glycerine for a few hours previous to mounting ; and when the object is thoroughly saturated with glycerine (which should be the strongest and purest obtainable) it should be transferred direct from the glycerine to the centre of a glass slip, all superfluous glycerine carefully removed with the help of a piece of blotting paper or rag placed at the side, and then, after gently warming the slip, a drop of warm glycerine jelly should be placed on the top of the object with a pointed glass rod, and the cover glass applied in the usual way.

Some workers prefer to get the object into position on the cover glass first and then invert it on the slip. If this plan is pursued, you should after carefully cleaning both cover glass and slip, breathe on the end of the slip and then place the cover glass on the condensed moisture ; it will adhere quite firmly enough to remain in position whilst you are arranging the object, and when this is done, the cover glass should be gently pushed with the tweezers to detach it from the slip and deftly inverted in the centre of the slide.

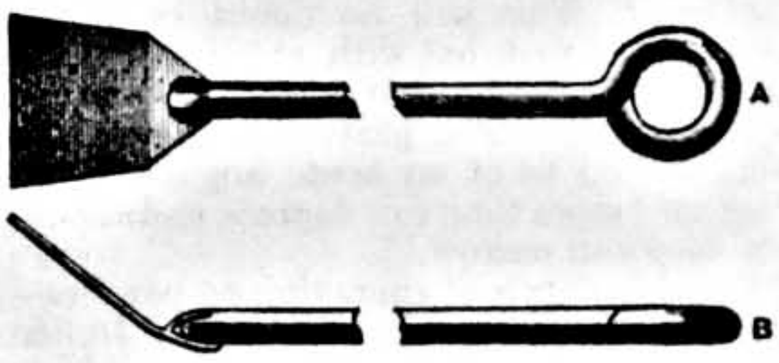

Fig. 3.—Spoon for Transferring Sections to Slide in—Front View (A) and Side View (B).

The glycerine jelly should now run out to the edge of the cover glass, but if it does not, another drop should be added at the edge, which will at once run in and fill up the vacant space. The slide should now be put aside to cool, and then it should be ringed with gold size, and finished off and labelled in the usual way. With a little practice, it is possible to make exceedingly neat mounts in this way, the great object being to get exactly the right amount of the medium on the cover glass, so as to avoid the necessity of cleaning away superfluous medium before ringing. I have some exceedingly pretty slides of fresh water algæ which I mounted in glycerine jelly fully ten years ago, and they look quite as well now as they did when newly mounted.

"Farrant" is an exceedingly useful medium for mounting the more delicate kinds of algæ in, and it is also used very largely for mounting delicate vegetable and animal sections. The latter will not stand much handling, and as a description of their preparation would take up more space than I have at my disposal at present, I will just defer giving it until a more convenient opportunity when treating of section cutting and staining, and give you here a few hints as to the methods I have found most successful in the mere process of mounting.

We will suppose that the sections are already cut and stained, and are now lying, either in spirit or in a solution of carbolic acid in water.

The chances are that the sections will be all curled up and mixed together in an almost indescribable mass. If this is the case, they should be emptied out into a basin of clean cold water, when they will gradually separate one from the other, and the most suitable ones for mounting can then be picked out with a dissecting needle.

As they are picked out, they should be dropped into clean spirit, and when they are thoroughly soaked in this, a watch glass or small porcelain tray should be filled with clean cold water. Having selected the section you wish to mount, it should be lifted out of the spirit on the point of a needle and placed upon the surface of this water. The result is almost marvellous ; no matter how much the section may be curled up in the spirit, as soon as it touches the surface of the water, it will lose all its folds instantaneously, and becoming *perfectly* flat, float upon the surface of the water.

This is exactly as it should be ; but now comes the question—"How am I going to transfer it to the slide without crumpling it up again ?" Fortunately, this difficulty is easily solved. Take a short piece of stout brass or copper wire and a piece of thin sheet brass or copper shaped as in Fig. 3, solder the two together as shown, and you will have a very convenient little instrument.

Now take this spoon, if I may so call it, and placing it gently underneath the section, lift it out of the water and slip it off on to the slip or cover glass prepared for it. A small camel's-hair brush will be of material assistance in making the transfer, and when the section is in position remove the superfluous water with blotting paper as before. Now place a drop or two of Farrant on the section and then apply the cover glass.

You will find that Farrant takes some few days to dry properly, and sometimes a mount which appeared to have no lack of medium when put aside will, a few days after, have some large vacant spaces at the edges. This can only be remedied by adding more Farrant in the usual way, and then when the edges are finally dry, the slide can be ringed with gold size and finished off as before.

It is necessary before ringing any glycerine mounts, to make quite sure that the surface of the cover glass and of the slip around the edges of the same are perfetly dry, otherwise the gold size will not adhere, and the result will be that after a certain time air bubbles will appear.

I have tried a great number of cements for the purpose of resisting the solvent power of glycerine, and my experience is that the ordinary gold size is, after all, the best, with, perhaps, the exception of an indiarubber cement made by dissolving pure rubber in wood naphtha. It is most important that the cement, whatever it is, should be very firm and adhesive, and not liable to crack when dry.

ENGRAVING ON METAL.

BY NORMAN MACLEAN.

ENGRAVING ON PEWTERS.

THIS branch of engraving is almost exclusively confined to London, as in no other place are pewter pots so extensively used. As a vigorous method is adopted in cleaning them by the use of silver or Calais sand, the engraving often wants renewing. Here, then, is an opening for some enterprising workman, who fails to find work in his own

line of business, to qualify himself for re-engraving these pewters, and forming a connection at the various large inns and public-houses in and about the metropolis. As these articles are in constant use, the engraver would probably be required to do his work on the premises, and should fit up a small handbag with the few necessary tools for the purpose. I need hardly say that a respectable exterior in the applicant for work at such places goes a long way in his favour. If the workman can use the graver, but has not been used to lettering, he can easily drop into the style of work on pewter, which in most cases is simply Italian or ordinary writing (Fig. 31), which is easy enough. The inscription usually consists of the proprietor's name, with the name of the inn or hotel; sometimes it takes the form of a rather nice monogram (Fig. 29), engraved in ornamental cipher, which, with its sprigging or spraying, looks very pretty.* I have sometimes seen the legend, "Stolen from—" here follows the name of the innkeeper and name of the inn. I suppose his customers were rather doubtful characters. For this line of business a very few tools are required. A sandbag 6 in. in diameter, two or three gravers with corks on the points, a lead pencil, tracing point, oilstone, oilcan, small bottle of turpentine, paper, small pot of letterpress printing ink for taking black prints, pair of dividers, a short length of crinoline steel for ruling lines, and a few clean rags, are all that are likely to be required.

Fig. 29.—Initials for Pewter.

In renewing the engraving of a pewter, take the most legible and recut the lines as carefully as possible. Perhaps the engraving will be so far gone that it will require drawing afresh. Such being the case, draw a line down the pot opposite to the handle, and across this line rule with the flexible steel, parallel lines ¾ in. apart for the capital letters, and ¼ in. apart for the small letters. Rule these three lines in the centre, midway between top and bottom; the centre can be got by means of the dividers. Draw in the name carefully, balancing the inscription so that it will extend a given distance each side of the line opposite the handle. Now cut in carefully, making the curves graceful, and the turns of the letters oval, thickening the down strokes, not forgetting the dots to the "i's" or the stops at the proper places. See that every word is spelled correctly, and put in any small improvement your own taste may suggest. Having done the first one to your own satisfaction, the next thing is to take a "black print." Take on the end of your finger a small quantity of ink and rub it into every cut. Then take a piece of paper and wipe off the ink from the surface of the pot, leaving the ink in the cuts. Next damp a piece of paper—writing-paper will do—and lay it on the engraving; place another piece of paper on the top of the first, and a piece of parchment on top of the whole, and rub with the round end of the point (Fig. 23, page 596) on the parchment until the paper is forced into all the cuts, bringing away the ink in its course.

* Occasionally, the engraving takes the form of a crest as in Fig. 30—the "Boar's Head."

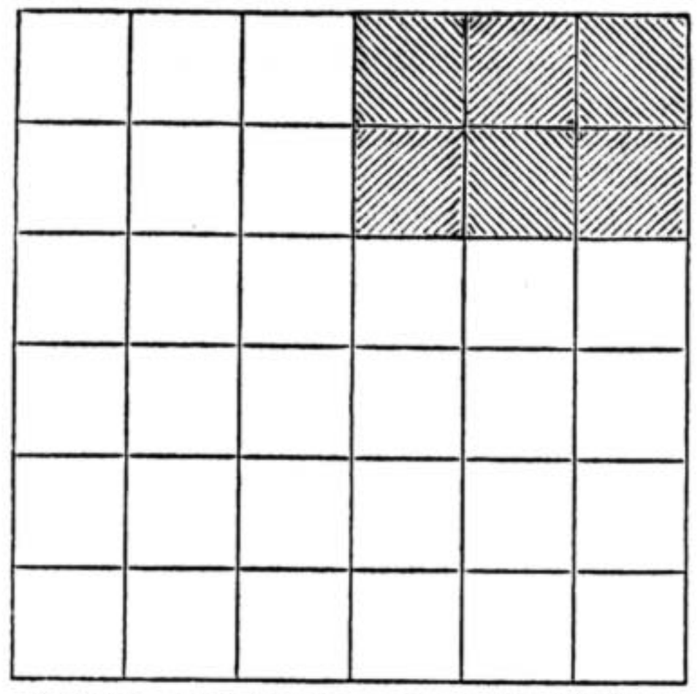

Fig. 28.—Example of "Colouring" Plate.

This is termed a "black print," and if properly taken will lay down a dozen or more impressions. As the impressions get faint, dust them over with the pounce bag, which will make them plainer. If the ink is very soft, mix a small quantity of finely powdered whiting with it; this will make it stiffer, and not so liable to smudge or smear. The print being taken, draw the line down the centre of all the pots to be engraved, mark with the dividers the height of the inscription, and proceed to "lay down" as many impressions as you can see from the print. From now, all "pointing in" is dispensed with, the inscription being *cut from the print*. This will no doubt be rather awkward at first, but with a little practice, and rather a longer graver than usual, soon becomes easy. The graver for this sort of work should be of an acute angle, and not "set off" more than five degrees, and should cut deep and narrow.

The other style of engraving on pewters—ornamental cipher—is the same Italian lettering embellished with sprays. It is usually entwined, which will be seen in Fig. 29. The work is done in a similar manner to that I have just described.

Pewter work is rather dirty, and owing to the presence of lead in the composition, care should be taken to wash the hands after work. It is also advisable to wear an apron with a "bib" or breastpiece, to avoid soiling the clothes, as the pewter, and most articles during the process of engraving, come in contact with the breast.

Having, I hope, successfully started the workmen in the brass plate, zinc, and pewter branches of engraving, I will now take up the young workman and endeavour to advance *him* a step. One side of the plate being engraved, it will be necessary to remount the plate on the block. Spring off the plate, and rub the dirty side over with a piece of tallow candle (this is the best thing I know of for removing cement), and warm the plate over the gas, holding one corner with a pair of pliers, and wipe clean with a piece of rag. Now warm the cement over the gas, and remount the plate as before. On the plate now rule parallel lines ½ in. apart, again ruling cross lines to form ½ in. squares, which may now be engraved. These lines being cut (noting, of course, from time to time the condition of the graver), fill in the squares with lines from corner to corner, the lines to be as nearly as possible $\frac{1}{32}$ in. apart, of the same depth. Each alternate square should be filled in with lines from corner to corner in the opposite direction (Fig. 28). This kind of "filling" is termed "colouring," and the style of ornament done in an irregular manner makes a good background for ecclesiastical lettering and ornament.

In making short cuts with the graver in line work, the graver is manipulated in a different manner to that used in cutting a long continuous line. This method or knack of springing the graver forward when within a short distance of the stopping line is peculiar and effective, and requires considerable practice to acquire it; but once acquired is used for finishing the cut on all kinds of work, whether colouring, veining, shading, or blacking out groundwork. The precision with which some engravers use this method is remarkable, never once slipping over the stopping line during a day's work.

Fig. 30.—Crest for Pewter.

A few words about gravers. Sometimes we find in using a new graver that the point will persistently break off, or be rapidly rubbed away; in either case, the graver is of no use in its present state. When this occurs, do not think that the tool is a bad one, as it sometimes happens that the end has become overheated during the grinding or tempering. The best thing to do is to break off about ½ in. and re-whet it. If the breaking of the point continues, let down the temper a shade or two, using for the purpose the end of a red-hot poker, and plunging into clean cold water immediately the colour has changed. For ordinary work I find a faint straw colour does best. In the case of the point of the graver rubbing away, it must be hardened and tempered again. Heat in a clear fire to a cherry red, plunge into cold water, rub one side of the graver with a piece of stone till bright, and temper as before directed. The breaking of a graver in the place required seems a simple matter, and there is a proper way of doing this. Place the graver intended to be shortened in a hand vice, with the end to be broken off above the jaws. Take a pair of pliers and nip the end firmly, and sharply twist the end of the graver off. The engraver having well practised the examples given for the practice plate, may now try something more ornamental in character, such as the outline of scroll work, etc. Excellent copies by Vere Foster, Esq., may be bought at any artists' material, etc., dealer's at twopence each, which includes ornament by

Fig. 31.—Style of Engraving Writing on Pewters.

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F. C. Hulme, Esq., I 1, 2, 3, and 4; Flowers, E 1 and 2; G 1 and 2; Marine (for vignettes), M 1, 2, 3, and 4; Animals, 0 to 10. The whole of the series may be had for nine shillings, or ninepence per part, and will always be found useful. The scroll work may, if a change be desired, be put on one side for a time, and letters and numerals be taken up. Vere Foster's A 2 drawing book will supply good copies. The workman at this point will do well to consider which branch of engraving he likes best, as if he wishes to get his living by it he will require to devote all his time to perfect himself in the particular line he desires to follow.

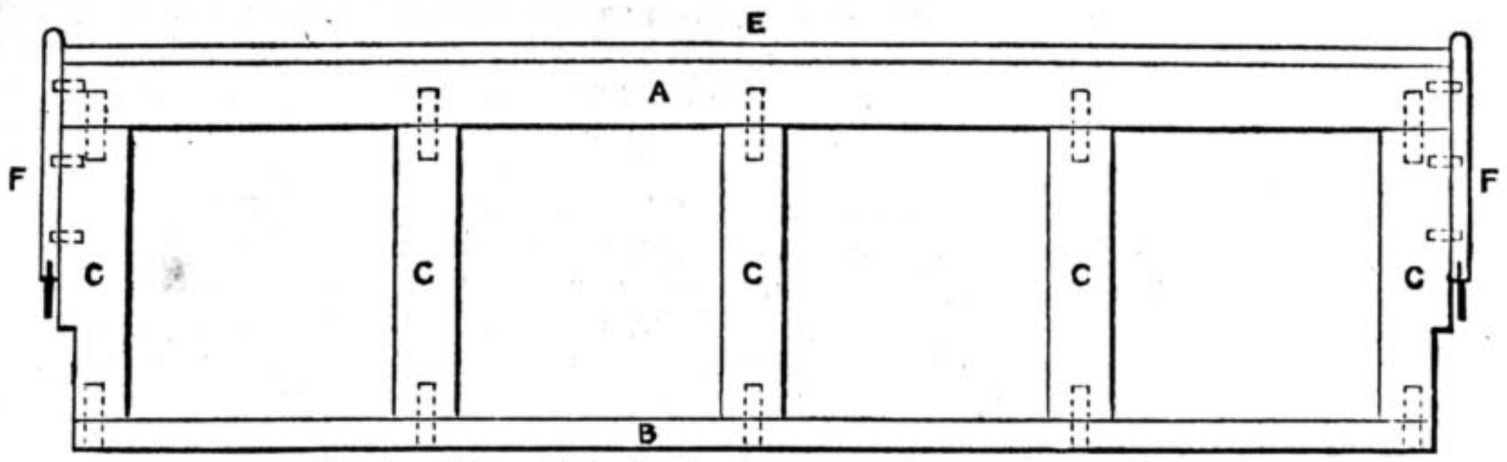

Fig. 1.—Plan of Key Bottom as seen from underneath.

A, Front rail; B, Back rail; C, Muntings, or cross rails; E, Lock front; F, Cheek. (Scale, 1 inch to 1 foot.)

HOW TO MAKE A PIANO.

BY "NIL DESPERANDUM."

THE CASE: ITS CONSTRUCTION AND PREPARATION FOR POLISHING.

WE have now arrived at the construction of the case or exterior, or, as it is technically termed, fitting up; it is so called because the parts of the case are fitted on the back after it has been strung and chipped up. The parts of the case are made for the fitter-up by a part maker, which in most factories is a distinct branch of the trade. You have, no doubt, observed, in perusing the papers on piano making, that I have taken one branch in each paper, but in this I will deal with part making and fitting up together. As the reader is aware, there are a variety of designs of exteriors, and I must leave it to the individual taste of the reader how he shall embellish his case; there is no rule for fancy: it is unlimited. Perhaps he would desire to make it so that it is in keeping with the furniture of the room where it is to occupy a position; or he may wish to paint panels for it, or plant mouldings on it, or put tiles or crewel-work in the front of it; whichever way he decides to adopt in making the case, so long as he is satisfied, I don't see that it is my place to grumble. I shall here give the names of the parts of the case as they are known in the trade, so that when I speak of the way in which they are put together he can follow me. They are named as follows: the ends, cheeks, top door, bottom door, top, back hollow, fall, lock front, plinth, trusses or brackets, truss toes, pilasters, and key bottom.

The case I recommend the amateur to make is what is known as solid: that is, one that is not veneered. My reason for this is, that I think it would be difficult for him to manage the veneering of the parts of the case without appliances; of course I am aware that the veneer may be rubbed down with a veneering hammer. For a cabinet maker to do this it might be a simple matter, but to the amateur I am afraid it would be very difficult on so large a surface as a piano case, unless he has had experience in veneering. In a piano factory the flat parts are veneered by means of sheets of zinc one-eighth of an inch in thickness, made hot, and placed between each layer of veneer after being glued to the wood and pressed down with iron cramps: these press the glue out, and leave them perfectly flat and free from blisters. Now, the back hollow and fall of a veneered case are usually shaped; they are jointed up in ribs of pine, and worked to the shape with planes. Then there are what are named cauls; these are made of wood, and shaped one to fit outside of the fall and the other inside: these are lined with zinc, and the fall, with the veneer glued on inside and out, is pressed into the caul with iron cramps.

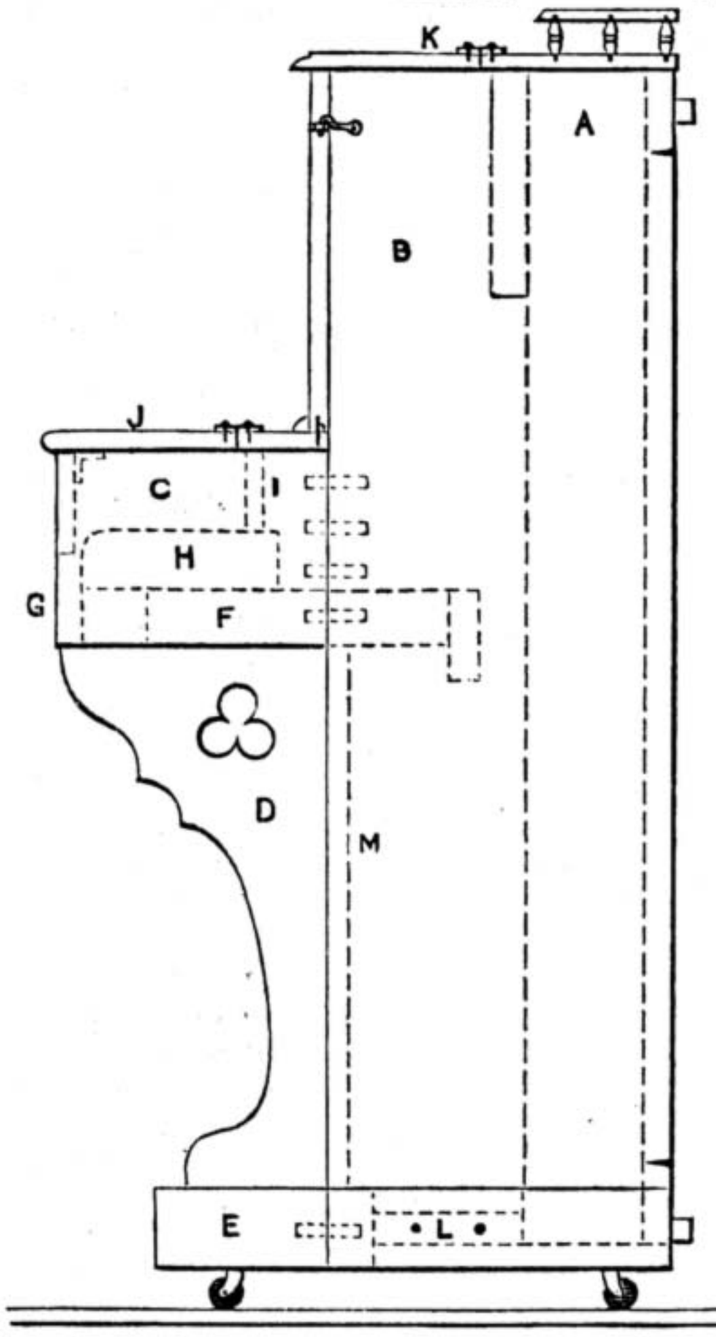

Fig. 2.—End Section of Case.

A, End of back; B, End of case to cheek; C, Cheek; D, Truss; E, Truss toe; F, End of key bottom; G, Lock front; H, Key block; I, Name board; J, Felted fall; K, Top with spindle rail; L, End of bottom board; M, End of pilaster.

Having given a brief outline of the method of veneering, the reader will see that to be successful he would need appliances: that is my reason for recommending a solid case. I have sketched the simplest style of case from a mechanic's point of view, but when complete it is very effective, and leaves room for the amateur to display artistic taste in more than one direction. If you desire a black case, it would be as well to make it with American white wood and ebonise it, and have some gold lines incised on it to relieve it, but the case I introduce to your notice I intend to be made of English walnut, as it matches over-mantels and the prevailing style of light and artistic furniture; but, as I showed before, it is a matter for the maker's discretion.

Procure at a good timber merchant's some dry English walnut; you will require also a 10 ft. length of 2 in. square pine for your key bottom. If you will kindly refer to Fig. 1, you will see how this is made; it is 4 ft. 2 in. long and 14 in. wide. You plane one side of your pine over and square the edges, then cut off your muntings or cross rails 11 in. long: you will require five of these. Now cut your front rail off 4 ft. 2½ in.; also you want a back rail the same length of 1 in. pine and 3 in. wide: these are dowelled together with round pegs of beech wood about ½ in. diameter. I need hardly say that you use glue as well: when this is dry, you plane the top, side level across, and straight in its length. This key bottom is the portion of the case where the keyboard rests on. Now take the back of the piano, and plane each end of it straight and square, lay it on your trestles strings uppermost,

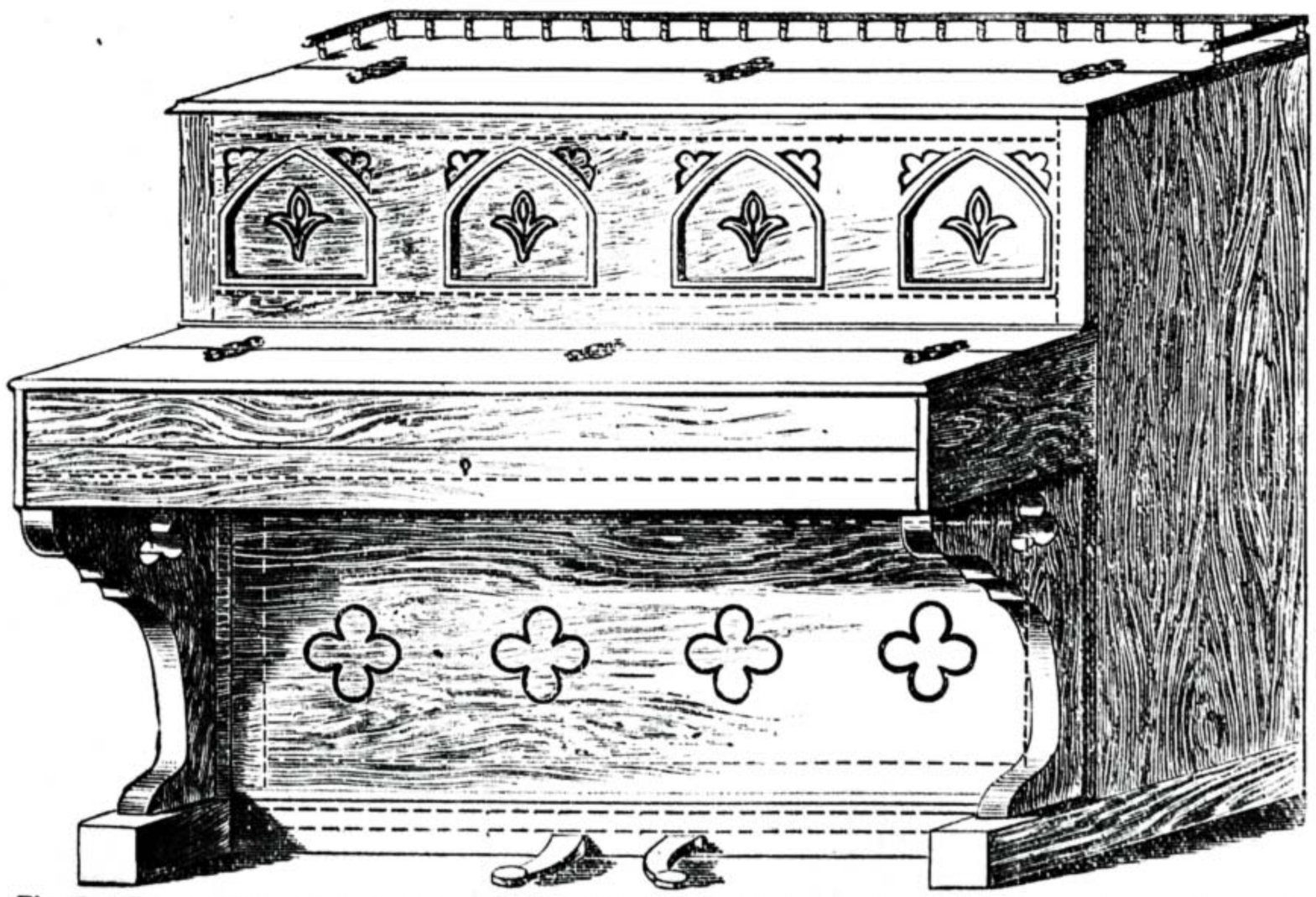

Fig. 3.—Case in Isometrical Perspective, Dotted Lines showing Top and Bottom Doors, Front of Key Bottom, and Bottom Board.

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and cover it over with a sheet to keep the shavings and dust from it. Now you make the ends of the case; you will require two lengths of ¾-in. walnut 3 ft. 7 in. long × 12 in. wide: these are the finished measurements I will give you, so that you can allow a trifle over these for working. Plane the sides over nicely and shoot your front edges straight, and square the top ends. Now, if you look at the end section of the case, you will find that the end stands from the front edge of the end to the wrest plank 6 in.; select the best sides of your ends for the outsides, and put a small nail in 6 in. from the front at the top of each end, and one at the bottom of the treble end 7⅜ in. from the front. These nails are only driven in temporarily, and allowed to stand out a little way for the ends to rest on the back; rest the treble end on the back, then take the bass end and rest the nail on the wrest plank. Stoop down and look across the top of the two edges of the ends, and either raise or lower the bottom end until it is level with the edges of the treble one; then make a mark and drive a nail in temporarily. Put some handscrews on, and see that they fit close to the back; if they do so, get your toothing plane and go over the parts to be glued. Now warm the ends and have your glue hot, so that it runs nicely from the brush, but not too thin; now glue one side and put your handscrews on as quickly as possible, then glue the other side in the same manner, keeping the square tops of your ends level with the top of the piano back. Having done this, you now prepare the cheeks, two pieces of walnut 10 in. long × 7 in. wide, and the same thickness as the ends; these are dowelled on the edges of the ends, at a distance of 1 ft. 9 in. from the top of the end to the bottom edge of the cheek. Put in four dowels ⅜ in. diameter and 5 in. long; glue halfway in cheeks; you can mark for holes by making a template of a piece of thin wood the width of cheek; pierce four small holes in, and mark through on the ends of your cheeks and also on the edge of your ends to correspond, so that the dowels in your cheeks will enter the holes in your ends, and you will see by diagram that the cheeks are put on the end of the key bottom in the same way, with dowels. Having glued the dowels in your cheeks and holes in the ends, put them in their place temporarily; see that they are square with the ends; now take your key bottom and place the top side of it to the bottom edges of the cheeks, with the back rail resting on the ends; now having got the cheeks upright, make a mark inside the cheeks near the ends of the key bottom at each end, then square a line across from these marks, and plane the ends of your key bottom to these lines, so that it fits between the cheeks; keep the bottom level with the bottom edge of the cheeks, and 1 in. from the top end of the cheeks; put a handscrew on each side temporarily, and then you can mark across with a small square and pencil over the bottom edge of cheeks and key bottom the position for your dowels you will require, three in each; now if you take it out and gauge a line 1 in. from the bottom edges of key bottom and cheeks, and square across from lines previously made, it will give you the exact position for holes. Glue the dowels in the key bottom, leaving them to stand out ½ an inch; try the cheeks on, and see that everything fits; now cut a piece out of each end of the key bottom ¾ in. wide, as per sketch, from the bottom of cheeks to the back: this is to give room for the pedals to work later on. Now make the ends of your key bottom warm and glue your cheeks on; put a couple of handscrews on; now glue the ends of your cheeks and the holes in your ends, and put the dowels in their respective places, and drive down with a mallet, having a piece of hard wood on the ends of the cheeks so that you do not bruise them; you will see that the cheeks and key bottom are put together at one operation. You now make a bottom board: this is fitted in between the ends, and level with the bottom of piano back, cutting a piece out to fit over the end of bent side and plate; it is glued on the bottom of the back and at the ends, and dowels are put through the ends into it: this is made of 1¼ in. pine, 4 ft. 2 in. long × 6 in. wide.

You now make the plinth: this runs along the edge of bottom board and runs through to outside of ends; you will have to cut a piece out of your ends to allow it to do so. This is 4 ft. 3½ in. long, 3 in. wide, and 1¼ in. in thickness. You can glue a piece of ¼-in. walnut on 1-in. pine to make up the thickness. Now make the pilasters of walnut 2½ in. wide; these are two in number, and are fitted one end under the cheeks at each side of the case, and the other end resting on the plinth, and the edge glued inside the end. Now, for the present, you may take your case off the trestles. To make the back flat and fall, you will require two pieces of walnut ¾ in. thick, and 4 ft. 4½ in. long; the back flat to be 3 in. wide, and the fall 8 in. wide; the edges to be planed straight, and to fit on the top of the cheeks; the ends to stand over the cheeks at each end ½ an inch and rounded; then you will want a name board of ¾-in. walnut: this is 2½ in. wide, and is glued on the under side of the back flat, at the front edge: it lays behind the keyboard. Now make a front flap to fall: this is 3½ in. wide, and fits between the cheeks under the front edge of the fall, and is hinged with small butt hinges to it. You can now fit the lock front: this is 3½ in. wide, and also fits between the cheeks, and is glued to the front edge of the key bottom after being cleaned up with glass-paper. The top is now made: it is what is known as half-top; the back half is 7 in. wide and is glued to the top of the back; the front half is also 7 in. wide; allow it to stand over ½ an inch at the ends and front, and bevel the edges. The two halves are joined together with fancy hinges to match hinges on the fall; in fitting these, it is only necessary to screw them on temporarily, as they will need to be taken apart to polish. You can now make the top and bottom doors. These are made in frames to fit the openings: the top door from the back flat to fit under the top, while the bottom door fits from the plinth to the key bottom, and between the two pilasters. The frames are to be made of ¾-in. walnut 1½ in. wide. Plane the edges square and cut off to the length you require to fill the openings, the long rails to go between the short ones, and a couple of dowels put through each rail. When these are glued together and dry, plane the sides smooth, and then you can get some ¼-in. walnut: this is to make the panels to cover the frames above mentioned. The panels to be planed over smooth and cleaned up with glass-paper, and the openings may be cut out; the trefoils can be bored out with a centre-bit; then these panels are glued on the frames, with pressure from small handscrews along the edges. The edges of the openings are also to be cleaned up, either left square or bevelled. Behind these openings there are four smaller panels fitted: these are made square, to cover over the trefoils, and after being polished, a design can be incised and gilded, or painted on them, and screwed on from behind. The top door is screwed to the back flat from underneath, the back flat being placed on short dowels in the cheeks, the top door being fastened with small hooks inside the ends to eyes in the back of the door. The bottom door has short dowels in the bottom edge, which fit in a couple of holes in the plinth, while the top part is held in position by two small buttons. Now you can make the trusses or brackets; you can glue two pieces of ¾-in. walnut together to make up the thickness, or buy 1½-in. walnut; these make 20 in. long. Now make the truss toes, 6 in. long and 3 in. thick; they are dowelled on to the plinth, and stand over the end ¼ of an inch. Then you make two end plinths, 3 in. wide, ¼ of an inch thick, to butt up to the truss toe, and glued to the bottom of the end. You now make a rail, ¾ in. wide and ½ an inch thick, and procure from a wood turner 2½ dozen spindles 3 in. long, with a ⅜-in. pin at each end; then, after putting a ¼-in. bevel on each side of the rail, bore corresponding holes in the back edge of the top and rail, and mitre the corners for the short rails. Now you can fit in your lock. Mark the centre of your lock front, then set your gauge to the pin where the key fits on, from the top edge of lock; make a slight mark on the lock front to cross the other, gauging from the top edges; now you want an escutcheon of brass; bore with a small bit in the mark you have made, and fit your escutcheon in with a ¼-in. chisel. You now fit the lock in from the top edge by boring it out, and marking it so that the pin comes to where the escutcheon is let in; glue this in, and clean off level with a file; now, having fitted the lock, you will need to fit the link plate in the front flap of your fall. Take your key, and turn the bolt up as though you had locked it; now take some of the black oil from your oilstone and place on the bolt, turn the bolt down, and close your fall; now turn the key again, as though to lock it, and it will make the mark on the fall where you are to fit the link plates. You must now clean up the whole of your case, preparatory to polishing. Have your smoothing plane set fine and sharp; also you want a steel scraper and various sizes of glass-paper from Strong 2 down to No. 1, using the strong paper first, then using the other sizes until you finish with No. 1; you want a square piece of cork to wrap your glass-paper on: these are sold at most tool shops. Any small holes may be filled up with shellac, using a hot iron or old file to melt it in the holes; minute holes may be filled by rubbing over a piece of beeswax, and then papering level. Exercise great care in cleaning up the case, as it makes a better finish when it is polished.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

115.—BELLARS' IMPROVED BURGLAR ALARUM CONTACT.

WHEN burglar alarum contacts are allowed to lie idle for many weeks or perhaps months hidden in a window frame or in a door post, the

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bearing parts are apt to become corroded and dusty. When the contact points are thus protected by a layer of dust or corrosion, the appliance fails to act until the protecting coat has been cleaned off. Many persons have experienced the annoyance of having to press a push button in hard several times before the bell can be got to ring, and this inconvenience is often caused by a dirty contact. We cannot expect the intending burglar to be so considerate as to take all this trouble in making an alarum bell ring, so must have the contact in working order when he calls. This condition cannot always be ensured with the old style pin and spot contacts, although tipped with platinum. Hence those appliances which are furnished with rubbing contacts are preferred before others. In the Improved Burglar Alarum Contact, invented by Mr. H. W. Bellars, a rubbing contact is ensured, and the working parts of the appliance are kept by this provision in working order. From Figs. 1 and 2 below, it will be seen that the rubbing motion is ensured by fixing one carved German silver spring to an insulated ebonite block on the base of the instrument, and causing the bent end of another German silver spring to rub against the other, when the door or window to which it is affixed is opened by the prowling thief. On comparing this with the contact shown at Fig. 53, page 485, a similarity in the mode of construction will be observed, but Mr. Bellars has given a longer rubbing contact to his springs. I prefer, however, a metal marble to a fixed lug of brass on the spring, because a ball or marble by its rolling motion causes less strain, wear, and tear on the spring and on the window sash. Mr. Bellars'

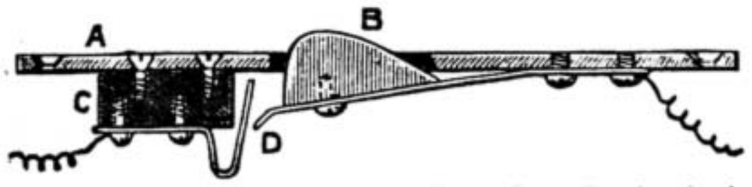

Fig. 1.—Bellars' Improved Burglar Contact in Section—A, Brass Plate; B, Brass Tongue; C, Ebonite or Hardwood Block; D, Rubbing Spring.

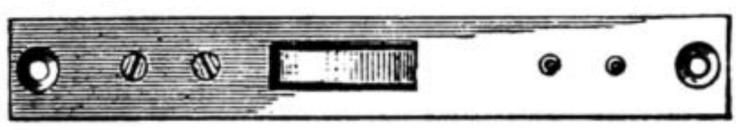

Fig. 2.—Ditto, in plan.

little appliance is strong and well made, and is very cheap at 12s. the dozen, the price at which they are now sold to the trade.

116.—KRISTALINE.

Under this name the firm of Messrs. J. & E. Hartley, Electro-platers, 13, St. Paul's Square, Birmingham, are importing and selling a colourless lacquer suitable as a protecting coat to electro-plated ornamental articles. The lacquer is made from a kind of celluloid or gun-cotton dissolved and held in some etherial solution which soon evaporates in a temperature of 90° Fahrenheit, and leaves an extremely thin but durable and almost invisible coat of protecting varnish on the article. The odour of the varnish resembles that of pine apple, or the well-known pear drops. It may be used for coating gilt or electro-brassed goods, or may be coloured if required for this purpose. The same firm also sell a cheaper article for lacquering brass. The price of kristaline is 16s. 6d. per gallon.

117.—POOL'S REPOUSSÉ WORKER'S ALBUM.

Repoussé workers will, I think, find a good shilling's-worth in Part 1 of the Repoussé Worker's Album, recently issued by Mr. Charles Pool, the Mechanics' Tool Depôt, 27, Hockley, Nottingham, and sent post free to any applicant for stamps to the value of 1s. 1d. The eight sheets contained in the part exhibit twenty good designs for door-plates, serviette rings, trays, crumb scoop, letter rack, pen tray, pipe rack, brush backs, photo frame, bellows plate, and stationery rack; affording an abundance of choice to those who are fond of this kind of work and may be on the look out for new patterns. Mr. Pool supplies in addition to general tools all tools and requisites for repoussé work, modelling, fretwork, wood carving, chip carving, engraving, and turning. THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

NOTICE TO CORRESPONDENTS.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Window Conservatory. — SANCHO (*Glasgow*) writes:—"In No. 12 of WORK, instructions are given in detail how to construct portable or tenants' greenhouses, which are well adapted for houses such as villas and cottages in country and suburban districts. But what are we residents of cities to

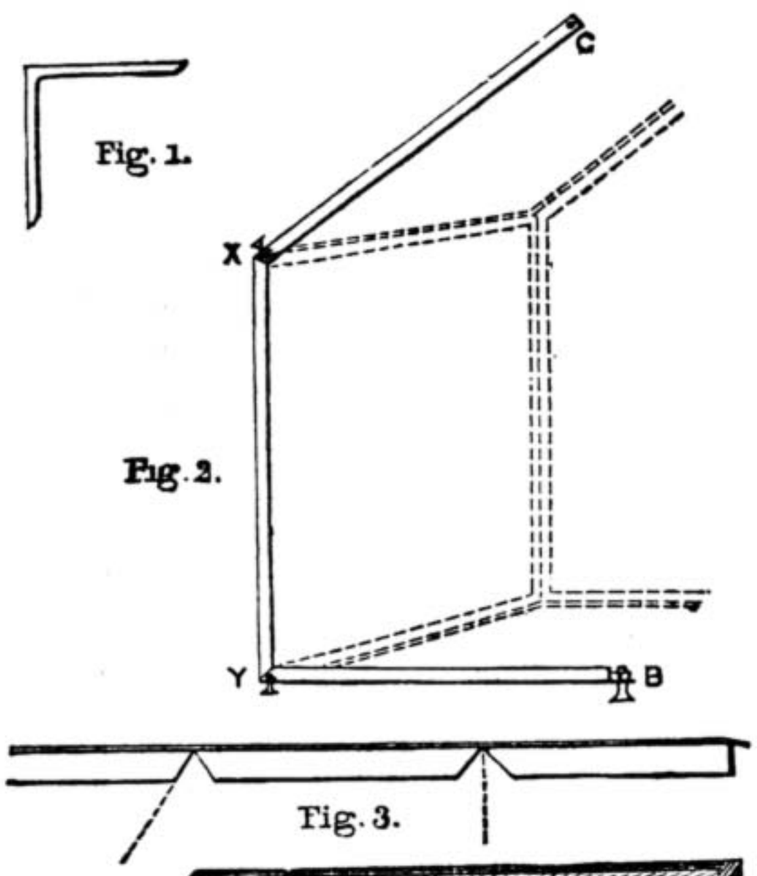

Fig. 1.

Fig. 2.

Fig. 3.

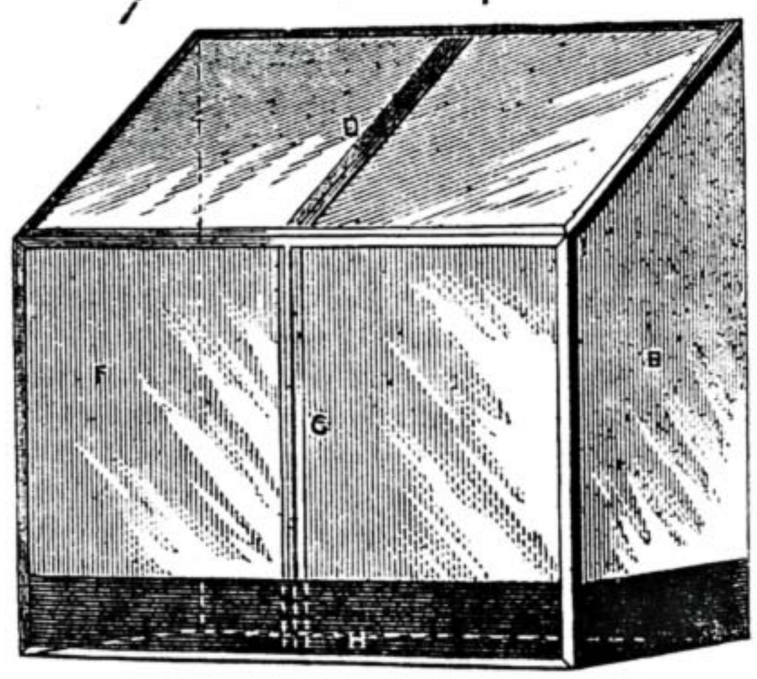

Fig. 4.

Window Conservatory. Fig. 1. — Angle Iron. Fig. 2.—Mode of Making Framing. Fig. 3.—Mode of Cutting Angle Iron. Fig. 4.—Window Frame or Case complete.

do, should our fancy lead us to the training of plants and flowers, where every available yard of ground is built on, leaving as little space for offices, etc., as possible, for building thereon, and where the houses are built so compact internally, that little or no space for a single pot and plant, either in the way of household duties, or in a place where it would not thrive if left on the window-sill outside without any protection, to die the first sign of winter? In the sketch given, I presume every workman will understand its use as a window conservatory. My mode of construction differs from the usual way of fitting up window conservatories, which are generally framed complete and laid on brackets, or brackets fixed and built in place. When removing (as workmen in cities very often do, like birds of passage, only to suit their respective employment) — I quote my own experience — the whole framework has to be taken asunder, or lifted out bodily, and seldom without mishap, and then, perhaps, it will not suit new premises without a deal of trouble. Then it is laid aside and neglected, and our hobby for flowers has flown, and the taste for the beautiful gone. To make one portable and in sections, procure two pieces of angle iron as in Fig. 1, 1½ in. × 1½ in. × $\frac{3}{16}$ in. Make two frames after the shape shown in Fig. 2, bent *vice versâ* for window sides, or instead of bending the angle iron cut inches out and bend the flat only, as in Fig. 3; after fitting exactly alike, have two pieces of angle iron to go across, as at X Y in Fig. 2. To fix frame outside window, the parts marked B must have a hole bored at end for a bolt run into stone with lead, and bound with nut on top. The parts marked C must have a hole bored at end to fix with iron rod screwed both ends, one screw longer than the other, to allow for slip into holes in stone side of window corresponding with holes in angle iron. The rod to slip through iron (angle) into stone brought back half and slipped through iron and stone opposite side, bound in place by jamb nuts or screws at ends of rods. The angle irons at X and Y must have holes in ends with holes corresponding, for fixing with small bolts and nuts. The frame complete is shown in Fig. 4. Next make the glass frames or cases. The top, D, neatly fitted in space; E and F, supporting top; G, additional support for top; H, sole, wood only, binding the three glass frames or cases on upright at bottom. For ventilation at any time when the lower sash of house window is closed, a small opening could be made in top or front glass frame to be opened and closed at will."

Spinning Wheel Mirror.—P. H. (*Allendale*) writes:—"I send a sketch, or rather photo, of a mirror which I made and have in possession for publication in WORK, hoping it may be of use to some of its readers. The carvings are carved in wood ¾ in. thick, and the scrolls at the foot of pillars ¼ in. thick glued on to brown oak (the carved feet or claws are but 1 in. thick); the rim which runs round inside of wheel rim to form the rebate to hold the glass in is ¼ in. thick. The fretwork or carving on top of mirror is of stuff ¼ in. thick, and the front of stand is veneer. All the ornamental work is in black oak, or, to name it rightly, bog oak. The spinning wheel rim and rest of mirror are of old brown oak. The

Spinning Wheel Mirror.

whole in combination makes a splendid mirror, being, as I have said, of black and brown oak. I have made a variety of hanging mirrors with the rim only set with carvings, and some of a fretwork and carving pattern, of which I will enclose pattern, four of them to cover the rim. The pattern is of my own design. I think it is useless to attempt to describe it any plainer, as most people know, or at least can look at a swing mirror to see, how it is built. After you have purchased a little spinning wheel take the spokes out, and glue joints afresh if it needs it, and then commence to make your mirror, etc. The mirror stands 2 ft. 3 in. from table to top of carving, and bottom, 2 ft. to 1½ in. from edge to edge of bottom mould."

Rubbing Down Oilstones.—C. H. M. (*Wylam*) writes:—"Under the heading of 'Means, Modes, and Methods,' in No. 31 of WORK, I see W. G. shows how to prepare a board with emery to be used in rubbing down oilstones. His method seems unnecessarily long. I was taught in my apprenticeship days, twenty years ago, to use a sheet of coarse emery cloth tacked on to a board by the corners. It might be glued to the board, but, as the oilstone is always a little greasy owing to the oil sinking into the stone, the dust ground off is able to stick to the emery cloth. When the cloth is only tacked to the board, it can be taken off and be well beaten on the back. This gets rid of the dust so well that the sheet of emery cloth lasts a long time. A sheet of No. 2 or 3 is the best to use, and the hardest oilstone seems to rub off about as easily as chalk comes off on a piece of smooth wood. One would have supposed that so simple a plan would have long ago found its way among every one who used an oilstone, but as I have often come across workmen who still grind up their oilstones on a grindstone or flat sandstone, it may be worth publishing (probably for not the first time by a long way) the method of grinding by emery cloth."

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Simple Incubator.—T. T. (*Fulham*) writes in reply to W. L. (*Kingsland*) (see page 557) :—"Could a thermometer be used in the incubator? If so, would it do to put it in the sand?"

Iron and Steel: Its Analysis. — A FOREMAN IN TIN WORKS writes: — "Owing to facilities afforded to the present generation for self-education, to the influence of Nonconformist ministers against drink being the one great object of life, and to the present rather high scale of wages at the Sydney Tin Works, a desire for scientific information has become established in classes where formerly the rule-of-thumb routine swamped all aspirations relating to the scientific processes in manufactures. Your above article is, it is to be hoped, only a prelude to a weekly series of similar information on such lines. May we ask for a percentage list or description of the slags resulting from modern iron and steel works, as we feel sure that if practical attention were directed to the subject that some commercial and profitable use could be brought about for the mountains of slag at present blocking up the works."

Combination Bedroom Suite.—F. C. writes:—"I am sure Mr. Scott will not be offended at T. B. R.'s suggestions—at least I hope not, as there is an old saying, 'two heads are better than one.' I, too, was so much pleased with the ingenuity of the suite that I took the first opportunity of my being in our nearest considerable provincial town to order the wood necessary for its construction, which, by the way, cost me in yellow pine £2 2s., which surprised me somewhat, as I had not thought it would take so much. As T. B. R. remarks (see page 555), I got 1¼ in. stuff for the frames, and here perhaps I may be permitted to remark that I am sure it would be a great convenience to the not very experienced amateur cabinet maker if a summary of the total amount of wood required were given at the end of the article. I would myself have done something by way of a start on this cabinet or wardrobe sooner, had I been able, without trouble, to say to the merchant what I exactly wanted. More experienced hands may be able to say at once what is needed for such a piece of work. Others who are beside the wood store can order it just as they want, but it is a different matter when you are at least sixty miles, as military men would say, from your basis. Though Mr. Scott expressly says he does not go into the construction, and his description of his excellent design is very full, there are undoubtedly several points which are not cleared up by the drawings, and, though I am by no means a tyro in such work, I fail to see how they are to be carried out. I have not the drawing before me now, so can from memory only speak of one point. The short drawer front on left in bottom compartment is drawn as a framed front. This for a drawer is, I think, a very unusual mode of construction, for unless the framing is mock—*i.e.*, merely slips pegged or glued on to front—the drawer sides cannot be dovetailed to the front, as they ought to be. What T. B. R. says of the looking-glass had struck me too. Also the risk, in case the spring catch for holding it up should at any time fail, of the glass falling down and being broken. I think the basin placed in a drawer, as suggested, would perhaps on the whole be the more convenient arrangement. Its jug might be placed sitting in it in the usual way, or else put in the central compartment right over the basin when closed in. Another point now occurs to me. I think Mr. Scott speaks of the drawer fronts as if they were to be flush with the case. In the drawing the edges seem as if bevelled off, so as to make the front project at least ½ in. or ¼ in. beyond the case. Is this so? I hope Mr. Scott will consider the suggestions given, and point out anything he may see against them before any of us commence work. I have often found that many would-be improvers, when they see anything they like, say, 'Oh, it would be a great deal better if it were so.' Whereas that very point with many another has been before the inventor's mind, and he has deliberately rejected it for some good reason. Now, while I do not see any objection to most of the suggestions of T. B. R., it may be the inventor does, and therefore we would be glad to have his views before us. Though I am struck with the ingenuity of the device for making the large panel serve as washhand table, I think it is attended with such disadvantages as make the drawer arrangement for basin much preferable—*e.g.*, unless you leave your clothes in the press open all day to dust. Whenever you wish to wash your hands, you have to open the door, let the panel down, arrange basin, etc., and then when done put all up again. This is a good deal to be done each time; besides, the panel is sure to be wet, and will shortly become discoloured and shabby if so used. If shut up wet or even damp, it is not good for whatever may be in the press. Instead of saying all stuff of ½ in. and styles of 1 in. or 1¼ in., would it not be well to say drawer fronts to be at least ¾ in. or ⅞ in. in rough, division frames between large drawers to be 1 in? Half inch here would look skimpy. I question, too, whether ½ in. for vertical division of compartments will not look equally skimpy."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Camp Stools.—A. S. S. (*Cheshire*).—In answer to your query, I have attempted to describe two forms of camp stools. In both diagrams you will observe that I have only given three-legged articles, as I see that the four-legged ones are patented. I do not think you would be infringing any patent rights by making one for your own use (although my knowledge concerning the patent law is not very extensive), but I consider that, by publishing sketches and description of making it here, I should be acting far from right towards the patentee. Your letter induced me to try to make a model of a four-legged stool, shutting up into one length, but having a different joint; and if you do not care for either of the two here shown, I would be willing, when it is finished, to send you a rough sketch of it, through the Editor, although I see no reason to

Fig. 1.

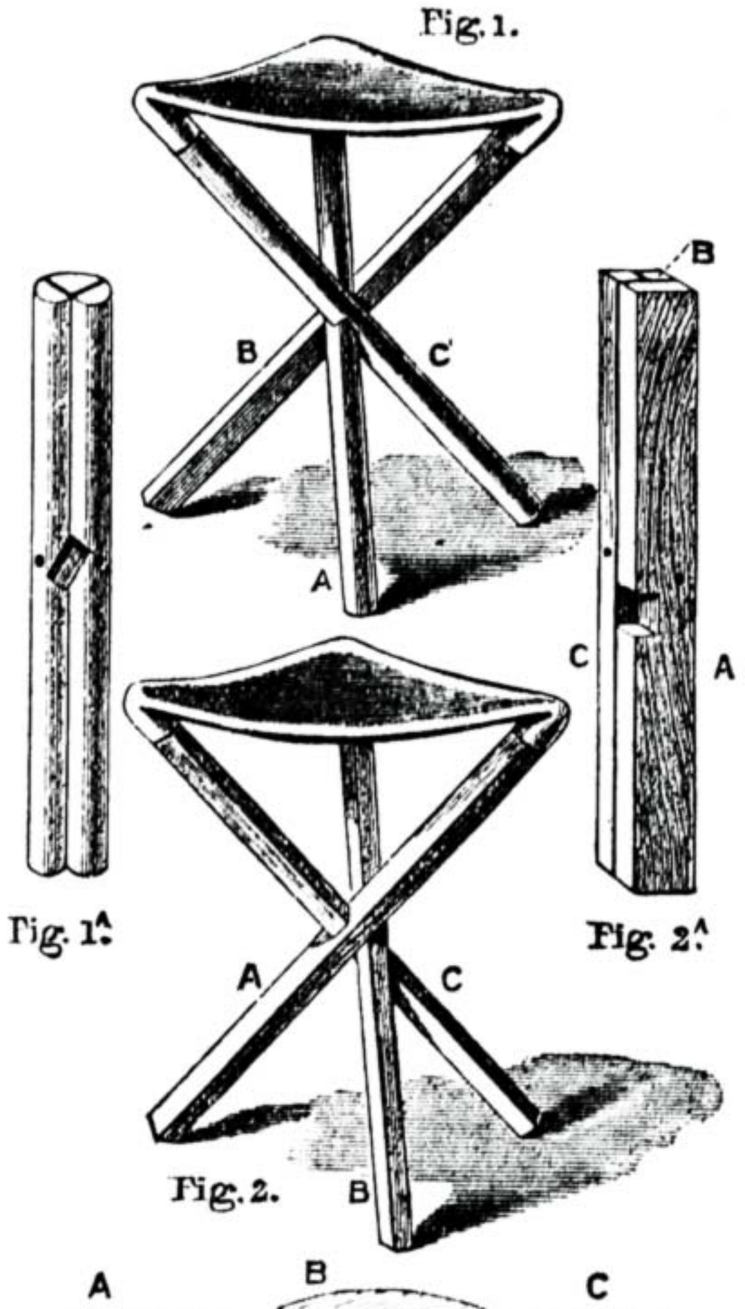

Fig. 1A. Fig. 2A. Fig. 2.

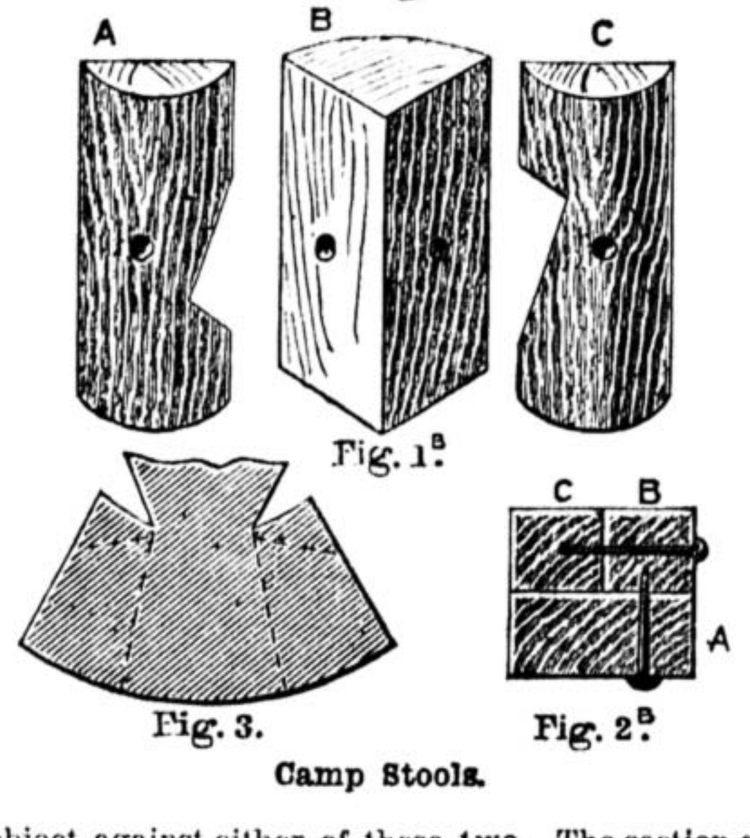

Fig. 1B.

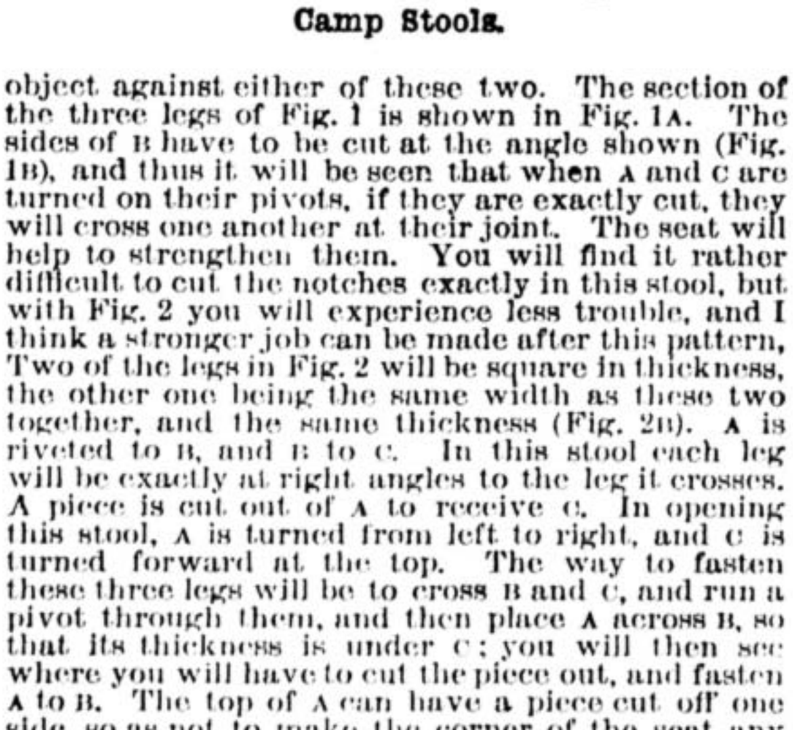

Fig. 3. Fig. 2B.

Camp Stools.

object against either of these two. The section of the three legs of Fig. 1 is shown in Fig. 1A. The sides of B have to be cut at the angle shown (Fig. 1B), and thus it will be seen that when A and C are turned on their pivots, if they are exactly cut, they will cross one another at their joint. The seat will help to strengthen them. You will find it rather difficult to cut the notches exactly in this stool, but with Fig. 2 you will experience less trouble, and I think a stronger job can be made after this pattern. Two of the legs in Fig. 2 will be square in thickness, the other one being the same width as these two together, and the same thickness (Fig. 2B). A is riveted to B, and B to C. In this stool each leg will be exactly at right angles to the leg it crosses. A piece is cut out of A to receive C. In opening this stool, A is turned from left to right, and C is turned forward at the top. The way to fasten these three legs will be to cross B and C, and run a pivot through them, and then place A across B, so that its thickness is under C; you will then see where you will have to cut the piece out, and fasten A to B. The top of A can have a piece cut off one side, so as not to make the corner of the seat any wider than the others. The rails may be rounded on the sides, and so make them collectively circular in section, but if this is done, it will be necessary to cut a different shaped notch in A. The corners of the material to form the seat might be cut after the manner I have shown in Fig. 3. The piece is bent round and sewn through the two long dotted lines, the two corners above the other dotted lines being sewn to the underpart of the material. The seat can be carried separately, but it will be best to tack it to the legs.—J. S.

Polishing Chairs.—J. F. (*Manchester*).—Pleased to hear you have found WORK so useful. You do not say what wood the chairs you wish to stain and varnish are made of, but I suppose they are light-coloured, and "in the white." By "stained varnish" I assume that you want a coloured varnish, by which you can darken the things to walnut colour at one operation. This may be done, but it is not so satisfactory as staining and varnishing separately, for the simple reason that if the coloured varnish chips off, the wood under it shows its original colour. When the wood is previously stained this does not happen. However, if you wish a combined stain and varnish, or rather to use a varnish which will colour your chairs in imitation of walnut, all you have to do is to colour the varnish accordingly. You may do so by mixing a little gas black and Bismarck brown with the varnish, and straining through muslin previous to use. By altering the proportions of the black and brown you may get any shade of walnut. Use spirit varnish.—D. A.

Tools.—W. H. R. (*St. Peter's Park*).—Without knowing something more than I do about the class of work you intend to undertake, I cannot give you a list of tools which would be certain to cover all your wants, but for general light joinery or cabinet making, you will find the following ample:—Some you might do without—for example, the jack plane could be dispensed with, if your wood is bought ready planed; but if you get all the following you will have a very good kit with which you can manage almost anything you are likely to want as a beginner. Of course if you want to go in for carving, turning and shaping, or fretting, you would have to extend the list greatly—Jack plane, trying plane, smoothing plane, rabbet plane, hand saw, tenon saw, dovetail saw, chisels from ¼ in. to 1 in., brace and bits, gimlets, bradawls, screwdrivers, scraper, cork rubber for glasspaper, hand screws, oilstone, hammer, mallet, square, cutting and marking gauges, etc. Lots of other things will come in useful as your skill increases, but you can add them as required. I am afraid this may be too late to be of much service to you.—D. A.

Veneering.—C. T. C. (*Brockley*).—The remarks to which you take objection are quite correct, and no mistake has been made by the writer. The heart side is the proper one on which to lay the veneer. It is also the side which tends to become convex, although you say that it would "surely be the other side, and that the formation of the wood is against the heart side becoming convex." Well, facts are stubborn things, and, however you have arrived at the decision you have, it will not alter them. I am afraid you have never tried practically to see whether your assertion is correct, for if you had you would never have made such a rash statement. Suppose you were to try the experiment of veneering one piece of a board on the heart side, and another piece on the other, and watch the result. The way the board bends is not a matter of opinion, but of fact, so that a test as proposed would be more convincing and intelligible to your comprehension than anything else. I quite agree with you that it is an important matter, but you know theory can't stand against practical experience, and I always advise amateurs and novices to try for themselves, if they think practical men wrong in their methods. As a rule, the practical artisan knows more of his own trade than any other people, and in the absence of very strong proof to the contrary, the assumption fairly must be that he is not altogether wrong, as you would imply he is in this instance. It would serve no good purpose to explain at present how the board goes as it does.—D. D.

White Acid for Glass Embossing.—NARPY (*Sheffield*).—The "white acid" mentioned by you is probably hydrofluoric acid, composed of hydrogen and fluorine in their combining proportions—namely, 19 parts of fluorine to 1 part of hydrogen. It is obtained by dissolving fluorspar in sulphuric acid, and condensing the acid fumes in water. It may be got through any chemist and druggist, in gutta-percha bottles The acid is dangerously corrosive, and will cause painful wounds if allowed to touch the skin. It will dissolve glass, or any other substance containing silicon, as china and earthenware, by the action of the fluorine on the silicon in the glass, hence it must be kept in gutta-percha ,bottles, on which it has no action.—G. E. B.

Future Subjects. — W. F. R. (*Plymouth*).—Thanks for suggested subjects. Effect shall be given to your suggestions in Vol. II. of WORK.—ED.

Restoring Writing Desk.—A. B. (*London*).—I suppose it is only the polish of your desk which has been scorched, and that the wood itself is uninjured. If this is the case, all you have to do is to scrape or clean up with glass paper, and repolish. If the wood is injured it will be a more serious matter, and I must have further particulars before I can help you. If you want further advice from us say, if you can tell it, the kind of wood, and especially say whether it is veneered or solid. Give any details you may think important, for in this, as in many other cases, the more particulars we have the better, if an answer is to help you as much as it might. Do not be afraid of giving too many particulars, thinking they will be of no use. Possibly they will not all be useful, but those that are not so will be skipped, so do not think you cause us any trouble by writing too explicitly.—D. A.

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Picture Frame.—WUN MARE.—You ask how you can decorate the top of a picture frame, of which you send a paper cutting. Now, how can I possibly tell you anything that is likely to be of the slightest assistance to you without knowing more than I do about your capabilities? For instance, if you can carve I should suggest that by carving you might vastly improve the appearance of the top, although so far as I can judge from the paper it is hardly worth while wasting much time on a thing which is fundamentally poor. As this, however, is a good deal a matter of opinion you may be inclined to lavish work on it, and I should certainly recommend carving. If you are unable to do this you might put pieces of silk plush at the back of the holes—or even pieces of a different kind of wood You do not tell me what wood the top of your frame is made of, nor the thickness, nor whether it is simply as an overlaid veneer that you have availed yourself of the piece as per paper. I might go on conjecturing for ever what would do for your purpose, and still fail to hit the point. It is really a pity that so many inquirers frustrate efforts to help them by withholding details which might be easily supplied.—D. D.

Polishing Music Cabinet.—W. H. C. (*South Norwood*).—Your music cabinet must, indeed, be an elaborately carved and moulded affair if you cannot get it polished for less than a sovereign, and I am inclined to think there has been a mistake somewhere. The figure is a ridiculous one for such a piece of furniture as a music cabinet; but are you sure that this is what a cabinet maker would call your contrivance? Is it not rather what he would call a cabinet—without the music—and consequently a much larger affair than ordinarily known as a music cabinet? If you wish to try the finishing yourself in the way you suggest, you cannot do better than use a mixture of whiting and turpentine, with rose pink for colouring. For varnish which "you could put on with a brush that would look better than ordinary varnish," all I can say is that much depends on what you call ordinary varnish. A spirit varnish is what you should use, but this is the ordinary varnish for such work. Of course you must not expect the same degree of finish as if your cabinet were to be properly French polished.—D. A.

Loadstone. — A. B. D. (*Whitburn*). — Natural loadstone (more properly lodestone) consists of a combination of the protoxide and peroxide of iron. It is found in considerable masses in iron mines in Scandinavia, Germany, Italy, Spain, China, and elsewhere. To procure it A. B. D. will probably have to go to some dealer in mineralogical specimens. Mr. W. Cutters (naturalists' agent), 35, Great Russell Street, Bloomsbury, London, W.C., would be able to supply him. He will get a serviceable lump for about 3s. Unless we are mistaken magnets are more commonly made at the present day by subjecting soft iron to a strong current of electricity.—M. M.

Bichromate of Potash v. Chromic Salt.—T. F. (*Manchester Square*).—Chromic salt or chromic acid in a battery gives more lasting strength to the battery than bichrome of potash.—G. E. B.

Reclining Chair.—CABINET MAKER (*Rawtenstall*).—The copper rivets you inquire about can be had from Stanton Bros., 73, Shoe Lane, E.C., or Faithfull, Boro', S.E. The cost is about 10d. to 1s. per lb. Both these firms are in London. I do not know of any place nearer your home where you can purchase rivets, but why not use iron instead; you can then have them made cheaply by your local blacksmith, or, if at all handy with tools, can easily make them yourself from a piece of iron rod, purchasing the necessary washers at the ironmongers. This would save you trouble, and economise postage or carriage.—G. LE B.

Practical Electricity.—S. G. (*Norwich*).—An authoritative book on this subject is Ayrton's "Practical Electricity," 7s. 6d., Cassell & Co.—F. J. C.

Copying Press Makers. — PICKWICK. — The following are good makers:—Hughes & Kimber, West Harding Street, London; Mordan & Co., 7, Cheapside, London. A book on engines and boiler construction is Wilson's "Treatise on Steam Boilers" (6s.), Lockwood & Co.—F. J. C.

Small Sideboard with Drawers and Cupboards.—PEAHEN. — You send a proper string of questions to be answered. Several of them need scarcely have been asked, as they are answered in the text accompanying the designs. But you want apparently to thoroughly understand what you are going to make, and some doubts are troubling you which you want set at rest. This very laudable ambition on your part I shall endeavour to assist you in attaining. First then, I presume you find a difficulty in carrying the moulding shown on the raking part of the pediment along the ends. After clamping the moulding on the pediment, and finishing it as seen in the front view, you must place a piece of wood behind the pediment to work the moulding on till it reaches the backmost part of the cornice moulding. This piece of moulding that is put on behind the pediment need not follow the rake of the pediment—it may be quite flat on its top edge (see Fig. 1). (2) The upper part consists of one frame with 6 panels in it—3 below the shelf and 3 above—on the top of which rests the canopy, and against which the shelf is screwed. The cornice, therefore, and the shelf and brackets are all screwed to this back frame, and are held together by that means. The two side parts of this large frame are dowelled, or pinned to the centre glass frame. (3) The panel under centre glass has a planted moulding round it of same section as that round glass. (4) The upper portion is secured to the lower portion by means of screws from below the top entering the bottom rail of upper part, and by the pins turned on the lower ends of the pillars. These pins should fit tightly into the holes bored for them in the top. Dowels should also be put into bottom edge of brackets to fit into top in same manner. (5) If the fillet shown behind moulding under top (Fig. 11) be the one you refer to, it is required to make the drawer work properly, and it is screwed at front and back to the gable. (6) The division between two top drawers is the same width and thickness as the drawer fore edges, and

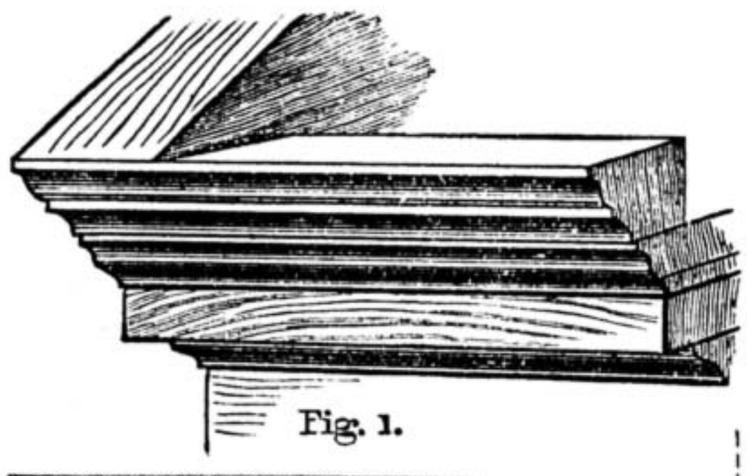

Fig. 1.

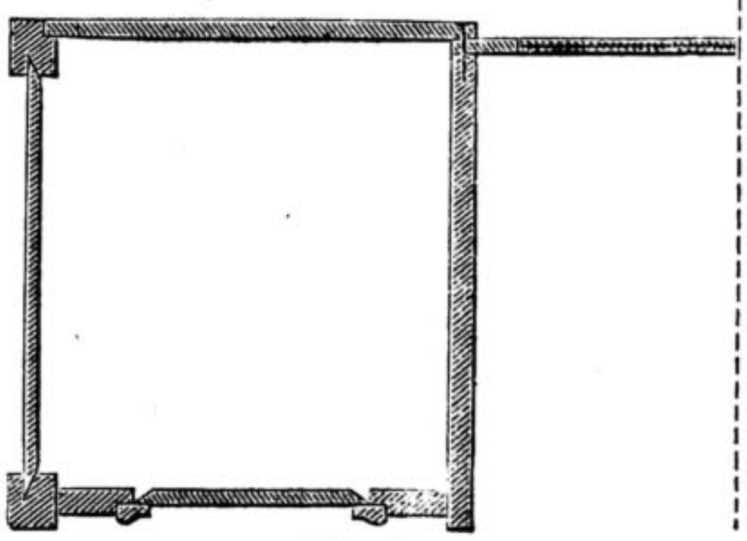

Fig. 2.

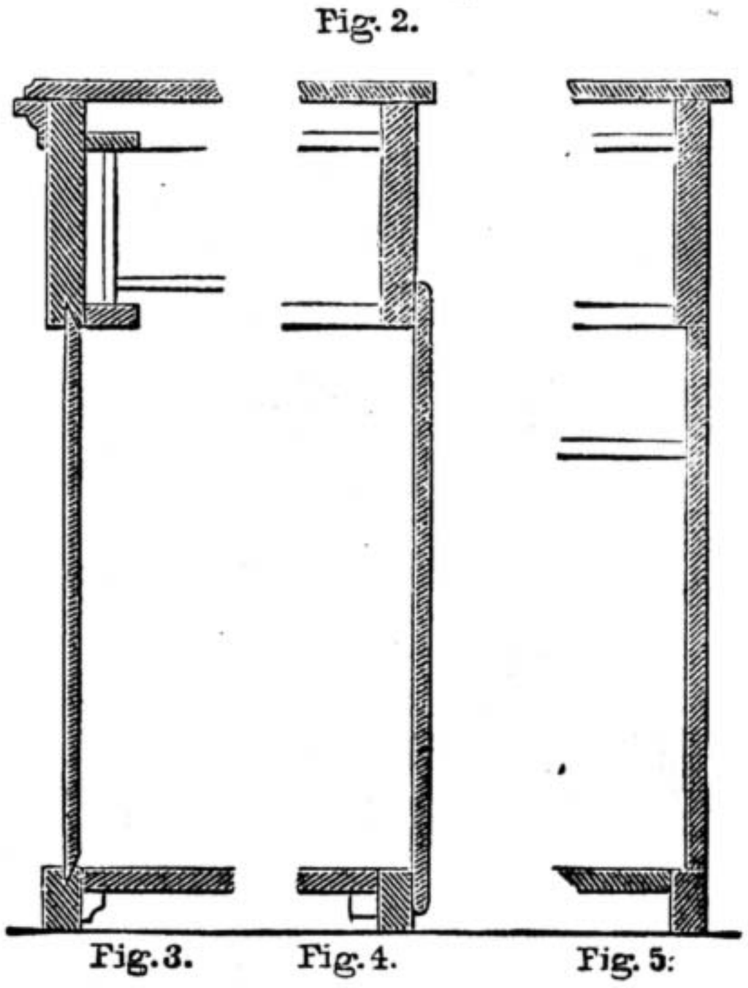

Fig. 3. Fig. 4. Fig. 5.

Small Sideboard with Drawers and Cupboards.

has two beads scratched on its face. It is mortised between the two fore edges. (7) The fore edge of centre drawer is mortised into the inner gables (8) which are ¾ in. thick. (9) The inner gables are fastened between bottom rail and fore edge by means of a pin or dowel. A fielded panel is one which has a broad shallow chamfer or bevel worked on its edges. Sometimes the fielded side is placed to the front and sometimes to the back. (10) The grain of bottom should run in the same direction as the top. It should be secured to end gable rails by means of dowels. There is not much fear of bottom splitting when it is blocked, if the wood is dry when you use it. (11) The shaded portion (in Fig. 12) under bottom rail refers, of course, to the little brackets underneath it. (12) The mouldings, shown in Fig. 2, in line with drawer fore edge consist of two beads scratched on top rail of gable, near its bottom edge. This top rail is broad enough to receive the drawer bearers on inside, so that it, therefore, appears in a line with the fore edge of drawer. A half-plan, showing horizontal sections of gables and carcase backs, etc., is given in Fig. 2, while an upright section of outer gable is given in Fig. 3, of carcase back behind cupboards in Fig. 4, and the same behind recess in Fig. 5. The inner gables being plain—not framed—an upright section is unnecessary.—A. M.

Silver Plating.—T. F. (*Manchester Square*).—When silver comes off from an article during the finishing process of scratch-brushing or burnishing, it shows either—(1) That the plating solution is not properly made up; (2) that the article was not properly prepared for plating; (3), or that the silver has been forced on too fast. The first fault you have certainly fallen into. You must not add the cyanide to the nitric acid solution of silver, as this will give you nitrate of potash in your plating solution, and thus cause the silver to go on in a loose condition. After dissolving the silver in nitric acid, diluted with one-fifth its bulk of distilled water, continue to heat the acid solution of silver until all the free acid has been driven off in the form of steam, and only a waxy paste remains. This paste will be nitrate of silver, and will form a solid lump when cool. Dissolve this in distilled water, and add to the nitrate of silver solution a solution of cyanide of potassium, a little at a time, stirring frequently with a glass rod, until the cyanide solution ceases to throw down white clots of silver cyanide. Allow it to rest for a few minutes, then pour away all the liquid from the silver cyanide precipitate, and pour in some clean water on the precipitate. Allow this to rest for a few minutes, then pour it off again. This is the way to wash the silver cyanide, and should be repeated two or three times to wash away all traces of nitrate of potash. When this is done, dissolve the silver cyanide in a solution of cyanide of potassium to form the plating solution. Note the weight of potassium cyanide used to completely dissolve the silver cyanide, and add one-fifth more to form free cyanide. Make up the solution with distilled water to contain at least 1 ounce of silver in each gallon of solution. The person whose instructions you followed, omitted those important details. Secondly, it is not enough to brush the article clean. By treating them thus, you have only made them mechanically clean, whereas they must be chemically clean to insure a perfect adherence of the silver coating. All mechanical cleaning still leaves on the article some particles of dust, or of loosened metal, and these must be dissolved off in a pickle before the article is placed in the bath. Dip them first in old nitric acid diluted with water, then in the cyanide dip, as you propose, before placing them in the plating bath. (See also my article on Brass for an account of pickles.) If they are to be burnished, they should also be quicked in a dilute solution of nitrate of mercury (½ oz. in 1 gallon of distilled water) before being put in the plating vat. Thirdly, if you use too much battery power and force on the silver too fast, it will strip off whilst being burnished. The current from one or two small Daniell cells, or Smee cells, in series, will be quite strong enough for your purpose. Let the silver anode exposed in the plating vat present the same surface as that of the article to be plated. I shall be pleased to advise you at any time.—G. E. B.

Acorn and Cone Work.—F. H. (*Darlington*).—For the work to which F. H. refers many objects which may be collected in country rambles will be found useful—all the many kinds of fir cones, acorns from the different species of oak, the beech-nut with its husk, grotesque and knotted twigs, etc. It is well to have plenty to select from before beginning work. These objects can be dried by putting them in an oven that is not too hot. Acorns will need to be taken from their cups and glued in again. For picture-frames, brackets, etc., the framework is best made of pine wood, which can be stained with umber to an oak colour. The smaller objects are merely glued on, the larger are secured either with small brass pins, the projecting ends of which are cut off with nippers, or with needle-points (which are sold by the pound for such purposes) the projecting ends of which are readily broken off. Another way is by breaking up large fir cones and gluing their scales over the entire surface of the wood so as to form a complete ground, and on this fixing the larger objects. In any case the whole, when finished, has to be varnished. Any good copal varnish will do, and by grinding burnt umber in it the work can be brought to the colour of old oak if desired. A camel-hair brush is used for putting on the varnish, and two thin coats are better than one thick one. While drying, the varnish must be kept from dust. Another method of utilising acorns is by piercing them from end to end, through cup and all, with a large needle (which must of course be done whilst they are yet soft), and threading them on wire. By a combination of such wires of acorns, baskets in which to suspend pots of ferns or flowers, and other half rustic matters, may be formed. These also need varnishing.—M. M.

Power of Daniell Battery.—LINEMAN.—If the cell in which the zinc element is placed is charged with a solution of zinc sulphate, and the cell in which the copper plate is placed is charged with a concentrated solution of copper sulphate maintained in this condition by a reservoir of copper sulphate crystals, the E.M.F. of each pair will be at starting about 1 volt, and this will probably work up to 1·07 volts, when the copper plate has been coated with electro-deposited copper. The E.M.F. of the 12-celled battery will, therefore, be 12 volts at starting, working up to 12·84 volts in the course of half an hour. The internal resistance of a Daniell battery varies considerably, and as the volume of current expressed in ampères depends upon the internal resistance of the cells, one cannot say exactly what the output of yours may be, apart from actual measurement. It is, probably, something

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between a quarter and a half ampère for the whole battery but not more. If copper is allowed to deposit on the porous partitions, the current will fail, not only on account of a higher internal resistance, but also because this short circuits the cells. To prevent this, keep the zinc, and also the zinc mud, from touching the porous partitions.—G. E. B.

Electro-deposition of Copper.—A. J. (*Manchester.*—(1) I do not know of a book devoted entirely to information respecting copper. "British Manufacturing Industries," Vol. IV., has an article devoted to Copper. In Bloxam's text book on metals, you will find an article on this subject. There are also some valuable lessons on copper working in Cassell's "Technical Educator." The electro-deposition of copper is fully treated in "Electro-deposition," by A. Watt, a book frequently mentioned in WORK. (2) It is possible to deposit a thin film of copper on both sides of a sheet of blotting-paper; but I do not know of any method apart from that of electro-deposition. Why do you object to this method? (3) There is no liquid which will soften a sheet of copper, either with or without dissolving it. A sheet of copper can be thoroughly softened by heating it to a dull red heat. (4) Copper will dissolve in sulphuric acid, and form copper sulphate; also in nitric acid, forming copper nitrate. (5) If you ask for annealed sheet copper you will get it soft; but if you want the softest copper obtainable, you will have to get pure sheet copper well annealed.—G. E. B.

Change Wheels.—E. G. (*Wolverhampton*).—Though your query was worded "chain" wheels, I perceive that you must have meant change wheels, and can picture your pleasure in coming upon the articles on page 438 of WORK, so clearly explaining how these are arranged. I hope you will thoroughly master that explanation. A very simple way to pick out the right wheels for the more ordinary threads is to put on the mandrel a wheel having ten times the number of teeth as there are threads per inch in the lead screw (in your case it would be twenty), then, on the lead screw, ten times the number of teeth as there are to be threads per inch in the screw you wish to cut. Thus, if you have two threads per inch in your lead screw, put twenty teeth on the mandrel; then if you want to cut six threads, put sixty on the lead screw; if ten, put 100 on the screw, etc.—F. A. M.

Screw-Cutting and Boring: Screw-Bore.—(*Warbleton*).—It weakens a screw such as the mandrel nose to cut a groove for the tool to run out into. You can avoid this either by drilling a little hole at the end of the thread, or by putting the left hand on the pulley of the mandrel to control its revolution at the end of the thread, and then gradually withdrawing the tool with the right hand by means of the feed screw. Of course this requires a little dexterity. The long hole in the casting of a poppet head must be very accurate indeed, and if you cannot use a bar to bore the heads in position on the bed, I should finish that hole with a parallel rhymer; a rose drill should do about as well if you leave very little for the last one to take off. I should use a ¾-in. boring bar in your case, turning up the cutter with the bar so as to ensure its cutting equally at each end.—F. A. M.

Picking Locks.—E. G. B. (*Rochester*).—Ordinary lever locks can be picked in the manner described in No. 26—*i.e.*, by raising the levers carefully one by one, and keeping sufficient pressure on the bolt to retain them in their position. This can be done with an instrument such as described, or with two small picks. It is, however, a tedious job, and it is usually much quicker to force the lock and repair it afterwards. Locks which have patented improvements, such as movable stumps, wedge, bolts, etc., etc., in addition to levers, are practically unpickable. The same may be said of a Bramah lock if it is in good condition, but the wards of this lock frequently get worn, and when this is the case they can generally be opened either with a blank or a goose quill. The ordinary letter padlocks are only made to open at one ward, so if you take down the letters off each drum, and put them on paper, you can see at a glance the different words the letters will make, and can try them in rotation. These can be bought for less than two shillings, so it does not pay to spend much time in trying to discover the ward, and the quickest way is to file the shackle off. The interchangeable ones, however, can only be opened by chance unless you know the combination. Letter locks are used extensively in America, but are not much in favour in this country, owing to the risk of forgetting the combination, being overlooked while setting the lock, or having it extorted by personal violence.—T. W.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Œolian Harp.—S. M. (*Gloucester*) writes in reply to G. L. G. (see page 476):—"I happen to have two recipes by me for the same, which I will submit for your perusal, and use if you think fit, though I can say nothing about the practical part of them. To construct an æolian harp, a box should be made of very thin cedar, pine, or other soft wood. It should be of a length exactly answering to the window in which it is intended to be placed, 4 or 5 inches in depth, and 5 or 6 inches in width. Glue on it, at the extremities of the top, two pieces of wainscot, about ½ an inch high and ¼ of an inch thick, to serve as bridges for the strings, and inside at each end glue two pieces of beech about an inch square, and of equal length to the width of the box, which is to hold the pegs. Into one of these bridges fix as many pegs (such as are used in a pianoforte, though not so large) as there are to be strings, and into the other fasten as many brass pins, to which attach one end of the strings. Then string the instrument with small catgut or first fiddle strings, fixing one end of them, and twisting the other round the opposite peg. These strings, which should not be drawn tight, must be tuned in unison. To procure the proper passage of the wind, a thin board, supported by four pegs, is placed over the strings at about 3 inches distance from the sounding-board. The instrument must be exposed to wind at a window partly open, and to increase the force of the current of air, either the door of the room, or any opposite window, should be opened. When the wind blows, the strings begin to sound in unison, but as the force of the current increases, the sound changes into a pleasing admixture of all the eight notes of the diatonic scale. An æolian harp is constructed after this manner: an oblong box of thin deal boards, about 5 or 6 inches deep, with a circle drawn in the middle of the upper side an inch and a half in diameter, around which are to be drilled small holes. Along the upper side of the box seven, ten, or more small strings of very fine gut are stretched over bridges near each end, like the bridges of a violin, and tightened or relaxed with screw pins. The strings must be tuned to one and the same note, and the instrument placed in some current of air where the wind can pass over its strings with freedom. A window which is exactly equal to the length of the harp, with the sash first raised to give the air admission, is a good situation. When the wind blows upon the strings, with various degrees of force different musical tones will be sounded. If G. L. G. adopts either of these methods, I should very much like to know the amount of success he meets with."

Battlesden Cart.—AN AMATEUR (*Paris*) writes in reply to W. W. W. (see page 444), who says "'he is astounded at some things said in reference to making a Battlesden Cart.' That feeling will subside as his intelligence expands. He says he is an improver. The few words I have to say will be of service to him, as he is obviously anxious for improvement, and desires it in a branch of his trade closely allied to the branches he is waiting to have explained in WORK. But first, to thank you for your courtesy in allowing adverse remarks to appear in your most useful columns, which, amongst other features of worth, enable workmen to express their views with unabridged freedom. This latitude will, I trust, teach the amenities of correspondence, and may be the starting-point of descriptive excellence, too often lacking in workmen's writing, which should make us bear and forbear, if some trivial mistakes in terms or omission of a word occurs to mar the completeness of good intentions in writing for others' guidance more than for their own gain. I know nothing of the writer of the article on 'Battlesden Cart Making,' so that I can say the few improving words to W. W. W. which, upon reflection, he will appreciate. First, as to it being written by a clerk—if so, it is to his credit. One of the leading writers on coachmaking, holder of prizes and certificates from the Coachmakers' Company and International and other Exhibitions for reports and improvements in carriages, was a workman like W. W. W., and was offered the position of clerk and manager at greatly increased wages. This did not detract from his competence to write on coachmaking, which is appreciated even in America, by the fact of seven different journals copying one of his articles as soon as it was seen in the States, and he is now supplying matter from the French Exposition for thirty journals, English and American, which are extensively copied into other journals. But to the part of my letter which I write specially for W. W. W.'s improvement. The writer on 'Battlesden Carts' spoke of shafts of American elm, which is different to the elm which seems to have come under his notice. It is extensively used for shafts in America, France, and, to a large extent, in England for cheap carts like those referred to. American elm is used for the sides, in alternate strips about four inches wide. Birch is used, but if the writer omitted that word, he would of course admit it, as W. W. W. must admit his quotation omitted the word 'American.' But it is to be of service in instructing the writer, and those who he said he asked about elm shafts, that I mainly write to inform him that there are about fifty-four varieties of elm, most of which grow in England, one extensively, which deserves the attention of W. W. W. It is the wych-elm, a straight-grained, tough, pale yellow wood, often with a small heart of dark brown colour. It bears the male and female blossoms on the same tree, and it is supposed the brown heart is due to the accidental impregnation of the female seed by the male seed of the brown or common elm. As this brown is not quite so tough as the yellow wood in some parts of England, the wych-elm is used for plough-beams, waggon and cart shafts, or parts where toughness or strength is essential. If cultivated with the same attention to pruning for straight growth as ash, it would be a useful wood for coachmakers, as it is now for wheelwrights in the country for waggon and cart work. It is a little dearer than the brown or common elm."

Simple Incubator.—NOVICE (*Johnstone*) writes in reply to W. L. (*Kingsland*) (see page 557):—"I find a very useful article under 'Simple Incubator,' which I mean to try. What kind of lamp would you advise, and how long will it burn? Is there nothing about regulating the heat, and has same to be kept constantly applied to it?"

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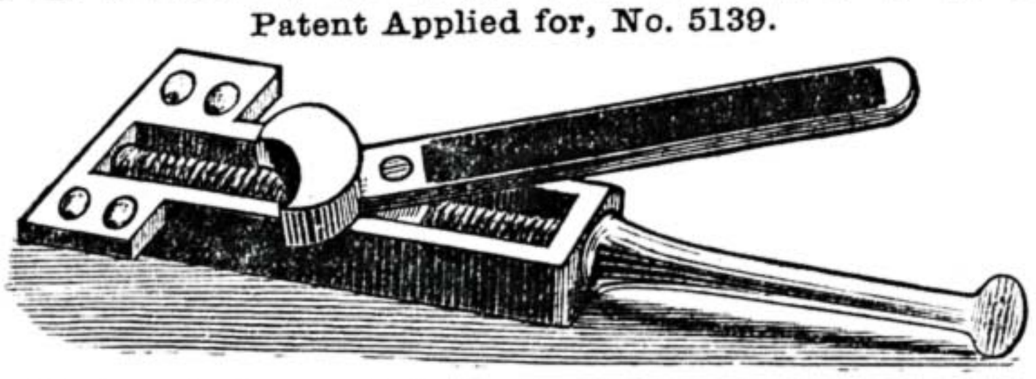

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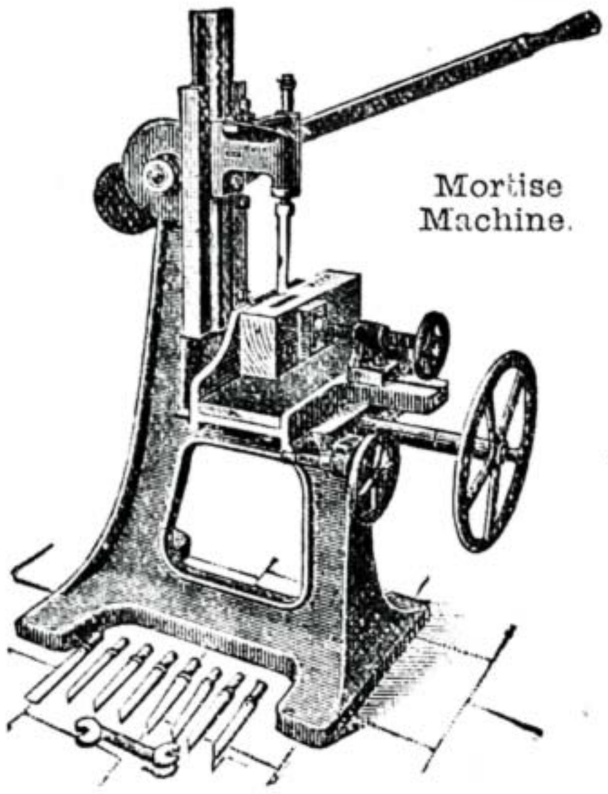

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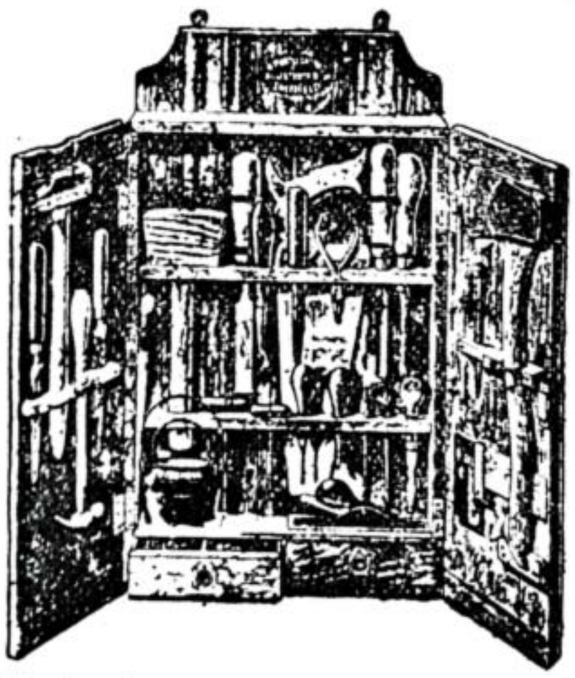

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